2.2.7 Noise and Vibration

2.2.7.1 Regulatory Setting

The National Environmental Policy Act (NEPA) of 1969 and the California Environmental Quality Act (CEQA) provide the broad basis for analyzing and abating highway traffic noise effects. The intent of these laws is to promote the general welfare and to foster a healthy environment. The requirements for noise analysis and consideration of noise abatement and/or mitigation, however, differ between NEPA and CEQA.

California Environmental Quality Act

CEQA requires a strictly baseline versus build analysis to assess whether a proposed project will have a noise impact. If a proposed project is determined to have a significant noise impact under CEQA, then CEQA dictates that mitigation measures must be incorporated into the project unless those measures are not feasible. The rest of this section will focus on the NEPA/23 Code of Federal Regulations Part 772 (23 CFR 772) noise analysis; please see Chapter 3, CEQA Evaluation, in this document for further information on noise analysis under CEQA.

National Environmental Policy Act and 23 CFR 772

For highway transportation projects with FHWA (and Caltrans, as assigned) involvement, the federal-Aid Highway Act of 1970 and the associated implementing regulations (23 CFR 772) govern the analysis and abatement of traffic noise impacts. The regulations require that potential noise impacts in areas of frequent human use be identified during the planning and design of a highway project. The regulations include noise abatement criteria (NAC) that are used to determine when a noise impact would occur. The NAC differ depending on the type of land use under analysis. For example, the NAC for residences (67 A-weighted decibels [dBA]) is lower than the NAC for commercial areas (72 dBA). Table 2.2.7-1 lists the NAC for use in the NEPA 23 CFR 772 analysis.

Table 2.2.7-1. Noise Abatement Criteria

Activity Category	NAC, Hourly A- Weighted Noise Level, $L_{eq}(h)$	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[1]	67 (Exterior)	Residential.

Table 2.2.7-1. Noise Abatement Criteria

Activity Category	NAC, Hourly A- Weighted Noise Level, $L_{eq}(h)$	Description of Activity Category
C[1]	67 (Exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52 (Interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72 (Exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A–D or F.
F	No NAC—reporting only	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical, etc.), and warehousing.
G	No NAC—reporting only	Undeveloped lands that are not permitted.
Notes: (1) Includes undeveloped lands permitted for this activity category.		

Source: Caltrans Traffic Noise Analysis Protocol, May 2011.

Figure 2.2.7-1 lists the noise levels of common activities to enable readers to compare the actual and predicted highway noise levels discussed in this section with common activities.

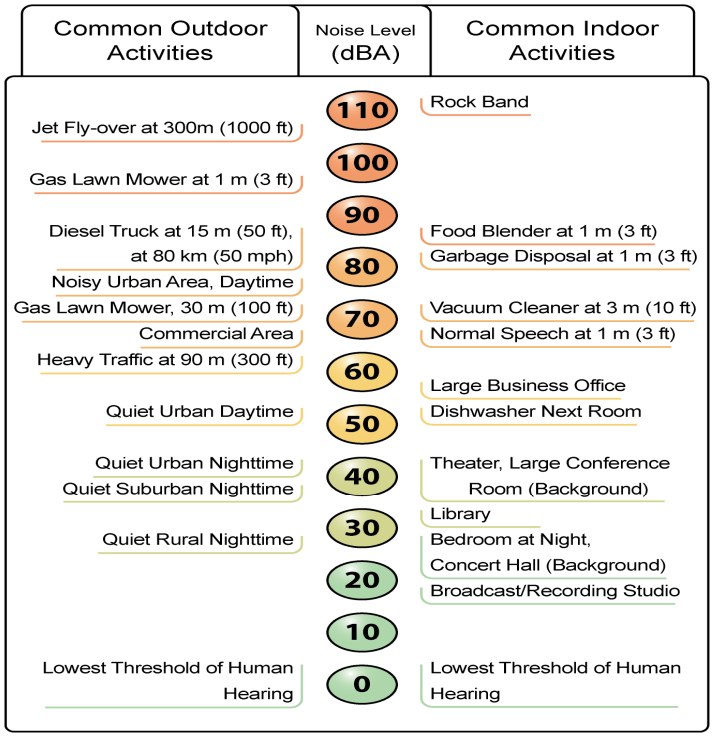

Figure 2.2.7-1. Noise Levels of Common Activities

According to Caltrans' *Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects* (Protocol) (May 2011), a noise impact occurs when the predicted future noise level with the project substantially exceeds the existing noise level (defined as a 12 dBA or more increase) or when the future noise level with the project approaches or exceeds the NAC. Approaching the NAC is defined as coming within 1 dBA of the NAC.

If it is determined that the project will have noise impacts, then potential abatement measures must be considered. Noise abatement measures that are determined to be reasonable and feasible at the time of final design are incorporated into the project plans and specifications. This document discusses noise abatement measures that would likely be incorporated in the project.

Caltrans' *Traffic Noise Analysis Protocol*sets forth the criteria for determining when an abatement measure is reasonable and feasible. Feasibility of noise abatement is basically an engineering concern. A minimum 5-dBA reduction in the future noise level must be achieved for an abatement measure to be considered feasible. Other considerations include topography, access requirements, other noise sources, and safety considerations. In addition, a minimum 7-dBA reduction in future noise levels must be achieved at one or more benefited receptors for an abatement to be considered reasonable. The reasonableness determination is basically a

cost-benefit analysis. Factors used in determining whether a proposed noise abatement measure is reasonable include residents' acceptance and the cost per benefited residence.

The Protocol defines the procedure for assessing the reasonableness of noise barriers from a cost perspective. A cost-per-residence allowance is calculated for each benefited residence (i.e., residences that receive at least 5 dB of noise reduction from a noise barrier that provides a design goal of 7-dB reduction for at least one receptor). The allowance is $80,000 per benefited residence. Total allowances are calculated by multiplying the cost per residence by the number of benefited residences.

In addition, barriers should be designed to intercept the line-of-sight from the exhaust stack of a truck to the first tier of receptors, as suggested by the *Caltrans Highway Design Manual,* Chapter 1100 (Caltrans, 2014).

2.2.7.2 Affected Environment

This section has been prepared based on the analysis and findings presented in the following technical studies:

- *Noise Abatement Decision Report* (January 2017)
- *Noise Study Report* (November 2016)

A detailed field investigation was conducted to identify land uses that could be subject to traffic noise impacts from the proposed project; as defined in the Activity Category of Table 2.2.7-1. Single-family and multi-family residences, as well as playgrounds and pools areas of multi-family complexes, were identified Activity Category B land uses. One school, several trails, and a seating area located at a pedestrian OC were identified as Activity Category C land uses. Commercial establishments, office buildings, and hotels with outdoor use areas were identified as Activity Category E land uses. There are also several parcels of undeveloped land throughout the corridor.

As required by the Protocol, noise abatement is considered for areas of frequent human use that would benefit from a lowered noise level. Accordingly, this impact analysis focuses primarily on locations with defined outdoor activity areas, such as residential backyards, common use areas at multi-family residences, parks, schools, and hotels. These noise receptor locations are also shown in Figures 2.2.7-2 (Sheets 1 through 20) and 2.2.7-3 (Sheets 1 through 20).

The *Noise Study Report* (NSR) analyzed seven distinct segments that are based on major local interchanges. The seven segments are:

Segment 1 – I-5 to SR-133: The area along NB I-405 is a mix of multi-family residences and associated recreational area (Activity Category B – Receptors R1.15 through R1.21) and commercial establishments without outdoor use areas, as well as office buildings with outdoor use areas (Activity Category E – Receptors R1.13 and R1.14). The area along SB I-405 includes multi-family residences and associated pool area (Activity Category B – Receptors R1.6 through R1.11), as well as the San Diego Creek Trail (Activity Category C – Receptor R1.12). The SB side of I-405 also includes commercial land uses with outdoor use areas (Activity Category E – Receptors R1.1 and R1.5). There is an existing property wall on top of a berm located on private property protecting the Activity Category B land uses to the south of this segment from highway traffic noise. The adjacent land uses are at grade relative to I-405.

Segment 2 – SR-133 to Sand Canyon Avenue: Areas along NB I-405 include office buildings with outdoor use areas and Kaiser Permanente, which does not have an outdoor use area (Activity Category E – Receptors R2.1, R2.2, and R2.8). The area along SB I-405 consists of multi-family residences and associated playground (Activity Category B – Receptors R2.3 through R2.6), undeveloped land (Activity Category G – Receptor R2.7), and a retail complex. Along this segment of I-405, the highway is at grade with respect to adjacent land uses.

Segment 3 – Sand Canyon Avenue to Jeffrey Road/University Drive: The land uses along NB I-405 contain single-family and multi-family residences, as well as a pool area and playground of one of the multi-family developments (Activity Category B – Receptors R3.1 through R3.16). The area along SB I-405 includes the Juanita Moe Trail and Bikeway (Activity Category C – Receptors R3.17 and R3.18). There is an existing property wall located at the property line protecting the single-family and some of the multi-family residences to the north of this segment from highway traffic noise. The land uses adjacent to I-405 are at the same general elevation as the highway.

Segment 4 – Jeffrey Road/University Drive to Culver Drive: Areas along NB I-405 contain multi-family residences and associated recreational areas (Activity Category B – Receptors R4.26 through R4.53). Areas along SB I-405 contain single-family and multi-family residences, including an associated recreational area (Activity Category B – Receptors R4.1 through R4.6 and R4.10 through R4.25), as well as Rancho San Joaquin Middle School and a bench located along the Yale Avenue pedestrian OC (Activity Category C – Receptors R4.7 through R4.9). There are existing property walls along the NB side of I-405, some of which are on top of berms located at the property line protecting Activity Category B land uses from highway traffic noise. There are also existing soundwalls located along the SB ROW that protect most of the residential land uses, as well as the middle school (SW271 and SW311). Along this segment of I-405, the adjacent land uses are at grade relative to I-405.

Segment 5 – Culver Drive to Jamboree Road: The land use along NB I-405 is a composite of single-family and multi-family residences (Activity Category B – Receptors R5.6 through R5.8 and R5.10 through R5.17), a seating area of the Freeway Trail (Activity Category C – Receptor R5.9), and Hotel Irvine and some office buildings (Activity Category E – Receptors R5.20 and R5.21). The land use along SB I-405 consists of a mixture of multi-family residences (Activity Category B – Receptors R5.1 through R5.5), as well as Boomers! Amusement Park and an office building with an outdoor use area (Activity Category E – Receptors R5.18). One of the multi-family complexes is a newer development with balconies but no ground floor outdoor use areas; this complex is protected from freeway traffic noise by a 22-foot-high property wall. There is an existing soundwall located at the ROW line of NB I-405 that protects the single-family residences from highway traffic noise (SW350). There are also existing soundwalls to the south of I-405 located on the ROW line and on private property that protect some multi-family residences, as well as two common recreational areas of two multi-family complexes (SW57, SW91, and SW31). Along this segment of I-405, the highway is at grade with respect to the adjacent land.

Segment 6 – Jamboree Road to MacArthur Boulevard: The area along NB I-405 contains the Hilton Garden Inn and Wyndham Irvine-Orange County Airport Hotel with outdoor use areas and office buildings (Activity Category E – Receptors R6.6 through R6.10). The area along SB I-405 includes a planned multi-family residential development with balconies but no ground floor outdoor use areas (Activity Category B – Receptors R6.1 through R6.5) and office buildings with one outdoor use area (Activity Category E). There is a planned property wall located at the property line protecting the planned development to the south of this segment from highway traffic noise. The adjacent land uses are at grade relative to I-405.

Segment 7 – MacArthur Boulevard to SR-55: Areas along NB I-405 include office buildings with outdoor use areas (Activity Category E) and airport parking (Receptors R7.1 through R7.3). The area south of I-405 consists of John Wayne Airport. Along this segment of I-405, the highway is at grade with respect to adjacent land uses.

2.2.7.3 Environmental Consequences

A Type I project, as defined in 23 CFR 772, is a federal or Federal-aid project for various project types, such as the addition of a through-traffic lane(s). As described below, the build alternatives include the addition of a minimum of one GP lane; therefore, the project is considered a Type I project.

The future worst-case traffic noise impact at frequent outdoor human use areas along the project corridor was modeled for the existing case, No Build Alternative, and two build

alternatives to determine appropriate abatement measures. This section discusses the future noise environment and feasible noise abatement measures for impacted locations. There is no substantial increase in noise from the implementation of either build alternative.

Alternative 1 (No Build)

The noise study results provided in Tables 2.2.7-23 through 2.2.7-15 indicate that predicted traffic noise levels for the future Design Year No-Build condition noise levels would approach or exceed the NAC of 67 A-weighted decibels (dBA) $L_{eq}(h)$ (equivalent noise level) for Activity Categories B (residential) and C (recreation) land uses at 72 of the modeled land uses. Modeled Design Year No-Build condition noise levels range from 52.5 dBA $L_{eq}(h)$ at Receptors R1.7.2 to 79.7 dBA $L_{eq}(h)$ at Receptor R5.19.2. Overall, noise impacts would be similar to the build alternatives. Comparative noise increases between the build alternatives and the No Build Alternative would range from zero to 1.9 decibels (dB).

Alternative 2 (Build – One GP Lane in Each Direction) (Preferred Alternative)

Segment 1 – I-5 to SR-133

Existing traffic noise levels in Segment 1 range from 51.8 to 74.8 dBA for Receptors R1.1 through R1.21. The future predicted traffic noise levels in Segment 1 range from 52.9 to 75.9 dBA, in which several areas would not approach or exceed the NAC for Activity Categories B and E and would not be considered impacted. These areas include five outdoor use areas of commercial facilities (Activity Category E) represented by Receptors R1.1, R1.2, R1.5, R1.13, and R1.14, and a multi-family development (Activity Category B) represented by Receptors R1.6.2 through R1.11.3. However, there are three areas that would approach or exceed the NAC for Activity Categories B, C, and E; therefore, consideration of noise abatement is required. Table 2.2.7-2 shows the existing and future noise levels for Segment 1 with Alternative 2.

Segment 2 – SR-133 to Sand Canyon Avenue

Existing traffic noise levels in Segment 2 range from 55.0 to 76.0 dBA for Receptors R2.1 through R2.8. The future predicted exterior traffic noise levels in Segment 2 range from 56.3 to 77.2 dBA. There is one area that would exceed the NAC for Activity Category E. However, there are no frequent outdoor use areas; therefore, noise abatement has not been considered. This receptor is for reporting purposes only. Table 2.2.7-3 shows the existing and future noise levels for Segment 2 with Alternative 2.

Segment 3 – Sand Canyon Avenue to Jeffrey Road/University Drive

Existing traffic noise levels in Segment 3 range from 52.1 to 74.0 dBA for Receptors R3.1 through R3.18. The future predicted exterior traffic noise levels in Segment 3 range from 53.2 to 75.3 dBA. There are a few areas that would exceed the NAC for Activity Categories B and C; therefore, consideration of noise abatement is required. Table 2.2.7-4 the existing and future noise levels for Segment 3 with Alternative 2.

Segment 4 – Jeffrey Road/University Drive to Culver Drive

Existing traffic noise levels in Segment 4 range from 58.6 to 73.7 dBA for Receptors R4.1 through R4.53. The future predicted traffic noise levels in Segment 4 range from 59.6 to 74.7 dBA. Traffic noise would approach or exceed the NAC for Activity Category B at 59 receptors representing 15 single-family residences, 80 multi-family residences, and 4 residential recreation outdoor use areas. The track and field/playing field area of Rancho San Joaquin Middle School would also exceed the NAC for Activity Category C and would be considered impacted by traffic noise.

The Traffic Noise Model (TNM) was updated to reflect that there is not an existing wall located at Receptor R4.27. The updated analysis showed that design year noise levels increased from 62.8 dBA in the original analysis to 63.6 dBA and existing noise levels increased from 61.9 dBA to 62.7 dBA under Alternative 2. This increase did not exceed the standard NAC; therefore, it is not considered a significant impact for residents at Receptor R4.27.

Although there are several existing soundwalls within Segment 4, predicted future peak-hour traffic noise would approach or exceed the NAC at many locations; therefore, consideration of additional noise abatement is required. Table 2.2.7-5 shows the existing and future noise levels for Segment 4 with Alternative 2.

Segment 5 – Culver Drive to Jamboree Road

Existing traffic noise levels in Segment 5 range from 53.4 to 79.7 dBA for Receptors R5.1 through R5.21. The future predicted traffic noise levels in Segment 5 range from 53.4 to 79.7 dBA. Impacted Activity Category B receptors included 22 single-family residences represented by Receptors R5.10, R5.12, R5.13, and R5.14; a pool and patio area represented by Receptor R5.15; and 2 units of a multi-family development represented by Receptor R5.17. Traffic noise impacts would occur along the Freeway Trail and Boomers! Entertainment Park (Activity Category C) represented by Receptors R5.9 and R5.18, respectively. Due to these identified impacts, consideration of noise abatement is required. Table 2.2.7-6 shows the existing and future noise levels for Segment 5 with Alternative 2.

Segment 6 – Jamboree Road to MacArthur Boulevard

Existing traffic noise levels in Segment 6 range from 65.7 to 77.9 dBA for Receptors R6.1 through R6.10. The future predicted traffic noise levels in Segment 6 range from 66.1 to 78.0 dBA, and the NAC would be exceeded for some Activity Category B and E receptor locations. Traffic noise abatement was considered for two Activity Category E locations where traffic noise levels for Receptors R6.8 and R6.9 exceeded the NAC. Table 2.2.7-7 shows the existing and future noise levels for Segment 6 with Alternative 2.

Segment 7 –MacArthur Boulevard to SR-55

Existing traffic noise levels in Segment 7 range from 66.2 to 70.9 dBA for Receptors R7.1, R7.2, and R7.3. The future predicted traffic noise levels in Segment 7 range from 66.6 to 71.1 dBA; therefore, the NAC for one of the Activity Category E receptors in this area would be impacted by traffic noise and abatement must be considered. Table 2.2.7-8 shows the existing and future noise levels for Segment 7 with Alternative 2.

Alternative 3 (Build – Two GP Lanes in Each Direction)

Segment 1 – I-5 to SR-133

Existing traffic noise levels in Segment 1 range from 51.8 to 74.8 dBA for Receptors R1.1 through R1.21. The future predicted traffic noise levels in Segment 1 range from 52.9 to 76.0 dBA. There are three areas that would approach or exceed the NAC for Activity Categories B, C, and E; therefore, consideration of noise abatement is required. Table 2.2.7-9 shows the existing and future noise levels for Segment 1 with Alternative 3.

Segment 2 – SR-133 to Sand Canyon Avenue

Existing traffic noise levels in Segment 2 range from 55.0 to 76.0 dBA for Receptors R2.1 through R2.8. The future predicted exterior traffic noise levels in Segment 2 range from 56.5 to 77.9 dBA. There is one area that would exceed the NAC for Activity Category E. Traffic noise impacts would occur at the exterior of Kaiser Permanente located north of I-405 (Activity Category E); however, because there are no frequent outdoor use areas, noise abatement has not been considered. This receptor is for reporting purposes only. Table 2.2.7-10 shows the existing and future noise levels for Segment 2 with Alternative 3.

Segment 3 – Sand Canyon Avenue to Jeffrey Road/University Drive

Existing traffic noise levels in Segment 3 range from 52.1 to 74.0 dBA for Receptors R3.1 through R3.18. The future predicted exterior traffic noise levels in Segment 3 range from 54.0 to 76.0 dBA, in which one area would not approach or exceed the NAC for Activity Category B and would not be considered impacted. This area includes a multi-family development

(Activity Category B) represented by Receptors R3.14.1 through R3.16. However, there are a few areas that would exceed the NAC for Activity Categories B and C; therefore, consideration of noise abatement is required. Table 2.2.7-11 shows the existing and future noise levels for Segment 3 with Alternative 3.

Segment 4 – Jeffrey Road/University Drive to Culver Drive

Existing traffic noise levels in Segment 4 range from 58.6 to 73.7 dBA for Receptors R4.1 through R4.53. The future predicted traffic noise levels in Segment 4 range from 60.2 to 75.2 dBA. Traffic noise would approach or exceed the NAC for Activity Category B at 59 receptors representing 16 single-family residences, 90 multi-family residences, and 5 residential recreation outdoor use areas. The track and field/playing field area of Rancho San Joaquin Middle School would also exceed the NAC for Activity Category C and would be considered impacted by traffic noise.

The TNM was updated to reflect that there is not an existing wall located at Receptor R4.27. The updated analysis showed that design year noise levels increased from 63.4 dBA from the original analysis to 64.2 dBA and existing noise levels increased from 61.9 dBA to 62.7 dBA under Alternative 3. This increase did not exceed the standard NAC; therefore, it is not considered a significant impact for residents at Receptor R4.27.

Although there are several existing soundwalls within Segment 4, predicted future peak-hour traffic noise would approach or exceed the NAC at many locations; therefore, consideration of additional noise abatement is required. Table 2.2.7-12 shows the existing and future noise levels for Segment 4 with Alternative 3.

Segment 5 – Culver Drive to Jamboree Road

Existing traffic noise levels in Segment 5 range from 53.4 to 79.7 dBA for Receptors R5.1 through R5.21. The future predicted traffic noise levels in Segment 5 range from 53.4 to 79.9 dBA. Impacted Category B receptors included a playground and balcony of a multi-family complex represented by Receptors R5.3 and R5.4.2; 28 single-family residences represented by Receptors R5.10 through R5.14; a pool and patio area represented by Receptor R5.15; and two units of a multi-family development represented by Receptor R5.17. Traffic noise impacts would occur along the Freeway Trail and Boomers! Entertainment Park (Activity Category C) represented by Receptors R5.9 and R5.18, respectively. Due to these identified impacts, consideration of noise abatement is required. Table 2.2.7-13 shows the existing and future noise levels for Segment 5 with Alternative 3.

Segment 6 – Jamboree Road to MacArthur Boulevard

Existing traffic noise levels in Segment 6 range from 65.7 to 77.9 dBA for Receptors R6.1.2 through R6.10. The future predicted traffic noise levels in Segment 6 range from 66.0 to 78.1 dBA, and the NAC would be exceeded for some Activity Category B and E receptor locations. Traffic noise would exceed the NAC for Activity Category B for Receptors R6.1 through R6.5, which represent several balconies of the Central Park West Apartments complex located north of I-405 that is under construction. Although these receptors were shown to be impacted by future traffic noise levels, the developer is responsible for providing abatement when the project is built; therefore, these receptors are for reporting purposes only. Traffic noise abatement was considered for two Activity Category E locations where traffic noise levels for Receptors R6.8 and R6.9 exceeded the NAC. Table 2.2.7-14 shows the existing and future noise levels for Segment 6 with Alternative 3.

Segment 7 – MacArthur Boulevard to SR-55

Existing traffic noise levels in Segment 7 range from 66.2 to 70.9 dBA for Receptors R7.1, R7.2, and R7.3. The future predicted traffic noise levels in Segment 7 range from 66.5 to 71.0 dBA; therefore, the NAC for one of the Activity Category E receptors in this area would be impacted by traffic noise and abatement must be considered. Table 2.2.7-15 shows the existing and future noise levels for Segment 7 with Alternative 3.

Construction (Short-Term) Impacts

Alternative 1 (No Build)

Alternative 1 (No Build) does not propose any construction or other disturbance; therefore, this alternative would not result in temporary impacts. No improvements would be implemented.

Build Alternative 2 (Preferred Alternative) and Build Alternative 3

Noise from construction activities may intermittently dominate the environment in the immediate area of construction. Construction noise varies greatly depending on the construction process, type, and condition of equipment used, as well as layout of the construction site. Many of these factors are traditionally left to the contractor's discretion, which makes it difficult to accurately estimate levels of construction noise. Temporary construction noise impacts would be unavoidable at areas right next to the project alignment.

It is possible that certain construction activities could cause intermittent localized concern from vibration in the project area. During certain construction phases, processes such as earth moving with bulldozers, the use of vibratory compaction rollers, impact pile driving,

demolitions, or pavement braking may cause construction-related vibration impacts such as human annoyance. It may be necessary to use this type of equipment close to residential buildings. Implementation of minimization measures described in Section 2.2.7.4 would eliminate or minimize vibration impacts during construction activities.

2.2.7.4 Avoidance, Minimization, and/or Mitigation Measures

A Preliminary Noise Abatement Analysis was conducted to determine appropriate abatement measures. Noise barriers were evaluated for feasibility based on achievable noise reduction. A map of existing and proposed noise barriers is available in Figures 2.2.7-2 (Sheets 1 through 20) and 2.2.7-3 (Sheets 1 through 20). For each barrier found to be acoustically feasible, reasonable cost allowances are calculated. Results from noise barrier analyses can also be found in Table 2.2.7-2 through Table 2.2.7-15. For any noise barrier to be considered reasonable from a cost perspective, the estimated cost of the barriers should be equal to or less than the total cost allowance calculated for the barrier. From November 2017 to January 2018, soundwall surveys were sent to the potentially benefited receptors for the potentially feasible and reasonable soundwalls identified in the NSR and *Noise Abatement Decision Report* (NADR).

Based on the studies completed to date and input from the public, Caltrans intends to incorporate noise abatement in the form of barriers at:

- The ROW along SB I-405 at the University Drive off-ramp (new Soundwall S255), with length and average height of 660 and 16 feet, respectively. Calculations based on preliminary design data show that the barriers would reduce noise levels by 7 dBA for eight residences at a cost of 329,700.
- The ROW along NB I-405 near and at the Culver Drive off-ramp (new Soundwall S322 – Option 1), with length and average height of 2,132 and 16 feet, respectively. Calculations based on preliminary design data show that the barriers would reduce noise levels by 7 dBA for 23 to 33 residences at a cost of $658,300 to $1,285,000.

If, during final design, conditions have substantially changed, noise abatement may not be necessary. The final decision on noise abatement will be made upon completion of the project design.

Alternative 2 (Preferred Alternative)

Nineteen (19) noise barriers were evaluated for feasibility based on achievable noise reduction in the NSR for Alternative 2. Tables 2.2.7-2 through 2.2.7-8 show the existing, future, and barrier analysis noise levels for Alternative 2. Of the 19 barriers evaluated, 11 barriers met the

design goal requirement of 7-dB insertion loss and were evaluated for reasonable cost allowance. Table 2.2.7-9 summarizes the range of allowances and construction costs for the feasible noise abatement measure considered, indicating that five walls were initially recommended for construction prior to the soundwall surveys. The recommended soundwall locations and heights are shown in Figures 2.2.7-2 (Sheets 1 through 20). The results are summarized below.

Segment 1 – I-5 to SR-133

Soundwall S114: Soundwall S114 was to be 1,550 feet long and located along the shoulder and ROW line of the NB lanes of I-405 between Irvine Center Drive and SR-133. This soundwall was to provide feasible noise abatement for the frequent outdoor use areas of 25 multi-family residences represented by Receptors R1.16.1 through R1.20.4. Soundwall S114 also met the design goal by providing at least a 7-dB reduction in traffic noise levels at Receptors R1.16.3 and R1.18.1.

The estimated total construction cost of $737,100 for this 14-foot-high wall was less than the reasonable allowance of $2 million and was to be considered reasonable due to cost; however, one additional impacted outdoor use area was benefited by increasing the barrier height to 16 feet for an additional construction cost of $93,500. Furthermore, an additional five residential balcony outdoor use areas would have achieved at least a 1-dB increase in traffic noise reduction. Therefore, with a total estimated construction cost of $830,600 for a wall height of 16 feet and a reasonableness allowance of $2,160,000, Soundwall S114 was considered reasonable due to cost, and it was recommended to be a 16-foot-high wall.

Soundwall S114 was later removed from further consideration based on completion of the residential viewpoint survey. Properties along the soundwall that would receive a 1 dB or more noise reduction were identified for the survey. Soundwall S114 is located within the State ROW; therefore, if more than 50 percent of the votes from responding benefited property owners oppose the noise abatement, the abatement will not be considered reasonable. Letters that are unclaimed or refused are removed from the consideration equation. Because Soundwall S114 is located within the State ROW, letters for which no response was received are counted as not opposing the soundwall and are removed from the consideration equation. A total of 30 survey letters were mailed to residents and the property owners for this soundwall. Of the four responses submitted, there were three “YES” votes and one “NO” vote. Sixteen (16) letters were unclaimed/refused, and no response was received for 10 other letters. Therefore, the total number surveyed was 4. In this case, the “no” vote was from one owner who opposed the abatement and the three "yes" votes came from renters. Per Protocol, for nonowner-occupied dwelling units, the renter gets 10 percent of one vote and the owner gets 90 percent of one vote.

Thus, per the protocol, the majority vote is in opposition, and Soundwall S114 is no longer considered reasonable from the viewpoint of the benefited receptors.

Segment 3 – Sand Canyon Avenue to Jeffrey Road/University Drive

Soundwall S228: Soundwall S228 was to be 460 feet long and located within private property along the NB lanes of I-405 between SR-133 and Jeffrey Road. Traffic noise impacts would occur at six second-story multi-family balconies located along NB I-405, which are represented by Receptors R3.11.2 and R3.12.2. Ground floor frequent outdoor use areas represented by Receptors R3.10 and R3.13 would not be impacted. Results of the barrier analysis concluded that a 16-foot-high soundwall would be needed to provide feasible abatement of traffic noise of 5 dB for the six impacted dwelling units and satisfy the 7-dB design goal.

The estimated total construction cost was calculated to be $339,200, and the six benefited second-floor balconies would have provided a total reasonableness cost allowance of $480,000. Therefore, this soundwall was considered reasonable due to cost and is recommended at 16 feet high.

Soundwall S228 was later removed from further consideration based on completion of the residential viewpoint survey. Properties along the soundwall that would receive a 1 dB or more noise reduction were identified for the survey. Soundwall S228 would be located on private property. Per Protocol, 100 percent of the owners of the private property upon which noise abatement is to be placed must support the proposed abatement. If no response is received from a property owner, their vote would be considered a "no" vote. Letters that are unclaimed or refused are removed from the consideration equation. A total of 27 survey letters were mailed to residents and/or property owners for this soundwall. Of the 15 responses submitted, there were 14 "YES" votes and one "NO" vote. Four letters were unclaimed/refused, and no response was received for 8 other letters. Therefore, the total number surveyed was 15. Per the protocol, 100 percent of the owners did not support the proposed abatement. Therefore, Soundwall S228 is no longer considered reasonable from the viewpoint of the benefited receptors.

Segment 4 – Jeffrey Road/University Drive to Culver Drive

Soundwall S255: Soundwall S255 would be 660 feet long and located on the ROW along the SB I-405 University Drive off-ramp. This soundwall would be 16 feet in height and meet the terminus of existing Soundwall SW271, which has a height of 14 feet at that location. This soundwall would provide feasible noise abatement for the frequent outdoor use areas of eight multi-family residences represented by Receptors R4.1 and R4.2.

The estimated total construction cost of $329,700 for this soundwall is less than the reasonable allowance of $640,000 and is considered reasonable due to cost. With consideration of the acoustic benefit and the incremental cost, Soundwall S255 is feasible and reasonable, and it is recommended to be a 16-foot-high wall.

Properties along the soundwall that would receive a 1 dB or more noise reduction were identified for the survey. Soundwall S255 is located within the State ROW; therefore, if more than 50 percent of the votes from responding benefited property owners oppose the noise abatement, the abatement will not be considered reasonable. Letters that are unclaimed or refused are removed from the consideration equation. Because Soundwall S255 is located within the State ROW, letters for which no response was received are counted as not opposing the soundwall and are removed from the consideration equation. A total of 23 survey letters were mailed to residents and/or property owners for this soundwall. Of 15 responses received, all were "YES" votes. Four letters were unclaimed/refused, and no response was received for 4 other letters. Therefore, the total number surveyed was 15. Thus, per the protocol, the majority vote is in favor of the soundwall. Soundwall S255 is considered reasonable from the viewpoint of the benefited receptors.

Soundwall S266: Soundwall S266 was to be 204 feet long and located within private property along the NB I-405 traffic lanes between Jeffrey Road and Culver Drive. Traffic noise impacts would occur at four ground floor patios and one second-story balcony of a multi-family apartment complex. An existing 6-foot-high property wall is located near the property line of a residential development. Results of the barrier analysis concluded that a 12-foot-high soundwall would be needed to provide feasible abatement of traffic noise of 5 dB and meet the 7-dB design goal at the ground floor receptor.

The estimated total construction cost was calculated to be $138,100, which is below the total reasonableness cost allowance of $320,000. Therefore, this soundwall was considered reasonable due to cost. Soundwall 266 was both feasible and reasonable; therefore, it was recommended to be a 12-foot-high wall.

Soundwall S266 was later removed from further consideration based on completion of the residential viewpoint survey. Properties along the soundwall that would receive a 1 dB or more noise reduction were identified for the survey. Soundwall S266 would be located on private property. Per protocol, 100 percent of the owners of the private property upon which noise abatement is to be placed must support the proposed abatement. If no response is received from a property owner, their vote would be considered a "no" vote. Letters that are unclaimed or refused are removed from the consideration equation. A total of seven survey letters were mailed to residents and/or property owners for this soundwall. Of the five responses submitted,

there were three "YES" votes and two "NO" votes. One letter was unclaimed/refused, and no response was received for one other letter. Therefore, the total number surveyed was five. Per the protocol, 100 percent of the owners did not support the proposed abatement. Therefore, Soundwall S266 is no longer considered reasonable from the viewpoint of the benefited receptors.

Soundwall S322 (Options 1 and 2): Two soundwall locations were analyzed by the NSR for the impacted receptors in this area. Because both of the soundwall locations were acoustically feasible and could meet the design goal, it was determined that both options would be presented in the NADR so that a selection could be based on the cost of constructing the soundwalls. Option 1 is located on the ROW with a length of 2,132 feet and would be effective in reducing traffic noise levels for impacted and nonimpacted receptors. Option 2 would be 955 feet long, located within private property, and focused on providing abatement to impacted receptors only.

As shown in Table 3-1 of the NADR, only Option 1 attains enough benefited units to raise the total reasonableness allowances above the total estimated construction costs; therefore, the design barrier for Soundwall S322 Option 1 will be used. The total estimated construction cost is $1,285,000, which is less than the total reasonableness allowance of $1,840,000; therefore, this soundwall is considered reasonable due to cost.

With consideration of the acoustic benefit and the incremental cost, Soundwall S322 Option 1 is feasible and reasonable, and it is recommended to be a 14- and 16-foot-high wall.

Properties along the soundwall that would receive a 1 dB or more noise reduction were identified for the survey. Soundwall S322 is located within the State ROW; therefore, if more than 50 percent of the votes from responding benefited property owners oppose the noise abatement, the abatement will not be considered reasonable. Letters that are unclaimed or refused are removed from the consideration equation. Because Soundwall S322 is located within the State ROW, letters for which no response was received are counted as not opposing the soundwall and are removed from the consideration equation. A total of 183 survey letters were mailed to residents and/or property owners for this soundwall.. Of the 78 responses submitted, there were 75 "YES" votes and three "NO" votes. Thirty (30) letters were unclaimed/refused, and no response was received for 75 other letters. Therefore, the total number surveyed was 78. Thus, per the protocol, the majority vote is in favor of the soundwall. Soundwall S322 is considered reasonable from the viewpoint of the benefited receptors.

Areas with Existing Noise Abatement

Receptors R4.3 through R4.7: There is an existing soundwall system (Soundwall SW271) that consists of two consecutive walls, one located on the ROW along SB I-405 University Drive off-ramp and the other extending along the freeway ROW from SB I-405 University Drive off-ramp to the Yale Avenue pedestrian OC. The existing Soundwall SW271 along the ramp is 14 feet in height from approximately Stations 258+00 to 265+00. The existing Soundwall SW271 along the freeway ROW transitions from 14 feet to 10 feet 8 inches between Stations 265+00 and 266+00 and maintains a height of 10 feet 8 inches from Station 266+00 to 286+00. Traffic noise impacts would occur at 18 multi-family residences and the track and field/playing field area of Rancho San Joaquin Middle School located along SB I-405. Receptor R4.4 was able to achieve feasible abatement and would require the existing soundwall to be replaced with one that is 22 feet in height; however, a taller noise barrier would not meet the design goal.

Receptors R4.12, R4.13, R4.14, and R4.16 through R4.23: Traffic noise impacts would occur at 46 frequent outdoor use areas represented by these receptors. The impacted receptors consist of 14 single-family residences (Receptors R4.12, R4.13, R4.14, R4.16, R4.17, and R4.18), 1 residential recreational outdoor use area (Receptor R4.14), 30 multi-family residences (Receptors R4.19, R4.20, R4.21, and R4.22), and 1 recreational use area of a multi-family complex (Receptor R4.23). The existing Soundwall SW311 is 10 feet 8 inches in height and located on the ROW along SB I-405 from the Yale Avenue pedestrian OC to the SB Culver Drive on-ramp.

Results of the analysis concluded that a 22-foot-high soundwall would be needed to obtain at least a 5-dB reduction of traffic noise levels at any of the impacted outdoor use areas. Only 8 of the 46 impacted outdoor use areas would achieve feasible abatement; however, none of the impacted or non-impacted receptors were able to meet the design goal of a 7-dB reduction of traffic noise levels. Therefore, noise abatement has not been considered for this area.

Receptors R4.29.2, R4.30.2, R4.31.2, R4.32.2, and R4.34.2: Traffic noise impacts would occur at eight second-story multi-family balconies located along NB I-405. An existing 6-foot-high property wall on top of an earth berm located on private property already protects this area from I-405 traffic noise. As a result, the wall was found to be not cost effective (reasonable); therefore, it would not be considered for construction.

Receptors R4.40: Traffic noise impacts would occur at one residential recreational use area represented by Receptor R4.40. There is an existing 6-foot-tall property wall on top of an earth berm located on private property. A barrier analysis was conducted to determine if replacing the existing property wall with a taller soundwall would provide feasible abatement. Results of the analysis concluded that a 20-foot-high soundwall would be needed to obtain at least a

5-dB reduction of traffic noise levels at this location; however, the noise barrier was unable to meet the 7-dB design goal.

Segment 5 – Culver Drive to Jamboree Road

Areas with Existing Noise Abatement

Soundwall SW350 is an existing soundwall located at the ROW line of NB I-405 that protects the single-family residences from highway traffic noise. Traffic noise impacts would occur at 22 single-family residences (Receptors R5.10, R5.12, R5.13, and R5.14), a community pool (Receptor R5.15), and a seating area (Receptor R5.9) along the Freeway Trail located north of I-405.

Receptor R5.9: Replacing the existing 14-foot-high soundwall with a taller soundwall, in front of the seating area, would not provide the minimum required 5-dB additional reduction of traffic noise levels; therefore, a taller soundwall would not be feasible.

Receptors R5.10, R5.12, R5.13, and R5.14: In addition to the existing 14-foot-high Soundwall SW350 along the ROW, an existing 6-foot-high property wall located at the property line also protects this area from I-405 traffic noise. The existing soundwall begins along the NB I-405 Culver Drive on-ramp and ends at the San Diego Creek channel. Results of the barrier analysis concluded that extending the length of the soundwall beyond the channel or replacing the existing soundwall with one at a taller height would not provide feasible abatement for the 22 single-family residences, represented by Receptors R5.10, R5.12, R5.13, and R5.14.

Receptor R5.15: Barrier analysis concluded that extending the length of the existing 14-foot-high Soundwall SW350 beyond the San Diego Creek channel or replacing the existing soundwall with a taller soundwall would not meet the requirements for the feasible 5-dB additional reduction of traffic noise levels.

Receptor R5.17: There is an existing 22-foot-high wall located at the property line that protects this complex; therefore, additional abatement could not be provided.

Segment 6 – Jamboree Road to MacArthur Boulevard

Soundwall S417: Soundwall S417 was to be 946 feet long and located on the ROW along the SB I-405 Jamboree Road off-ramp. Building plans indicated that the developer is providing traffic noise abatement by building a 13-foot-high property wall along the northern property line and ROW. Traffic noise level analysis conducted for this area assumed that the property wall will be built as shown in the builder's plans; however, with the 13-foot-high property wall, traffic noise would exceed the NAC for Activity Category B for Receptors R6.2.2 through

R6.5.5, which represent the balconies of the planned building. Results of the barrier analysis concluded that constructing a soundwall at the ROW line would have provided feasible abatement for some of the impacted balconies. The total reasonable allowance for the proposed 18- and 20-foot design barrier benefiting 10 residents is $800,000. The estimated total construction cost of the design barrier is $872,000, which is more than the total reasonable allowance; however, the wall may have been considered as part of the project if the margin between the total reasonable allowance and the estimated construction cost diminished upon evaluation of the final built condition of the development.

With consideration of the acoustic benefit and the incremental cost, it was recommended that Soundwall S417 would be an 18- and 20-foot-high wall.

Since completion of the barrier analysis, Lennar Properties, the property owner adjacent to Soundwall S417, provided as-built updates of their development. The as-built conditions showed that their buildings are at elevations higher than those assumed in the TNM modeling for the project. Accordingly, the elevations were revised in the traffic noise impact analysis, and the resulting benefited receptors dropped from 10 to 5. This decrease reduces the reasonableness allowance to $400,000. Compared to the estimated construction cost of $860,500, Soundwall S417 would exceed the total reasonable allowance. Therefore, with consideration of the acoustic benefit and the incremental cost, Soundwall S417 is not reasonable and was removed from further consideration.

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Table 2.2.7-2. Noise Levels for Existing, No Build, and Build Alternative 2 (Preferred Alternative) – Segment 1

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)					Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	Feasible	Design Goal Achieved
R 1.1	--	68.8	70.0	70.0	No	--	--	--	--	--	--	--
R 1.2		61.0	62.0	62.0	No	--	--	--	--	--	--	--
R 1.3		71.5	71.9	72.1	No	--	--	--	--	--	--	--
R 1.4		70.3	70.8	71.0	No	--	--	--	--	--	--	--
R 1.5		56.9	57.5	57.5	No	--	--	--	--	--	--	--
R 1.6.2		53.5	54.2	54.3	No	--	--	--	--	--	--	--
R 1.6.3		64.3	65.0	65.3	No	--	--	--	--	--	--	--
R 1.7.2		51.8	52.5	52.9	No	--	--	--	--	--	--	--
R 1.7.3		54.8	55.5	55.8	No	--	--	--	--	--	--	--
R 1.8		52.6	53.3	53.6	No	--	--	--	--	--	--	--
R 1.9.2		55.3	56.0	56.4	No	--	--	--	--	--	--	--
R 1.9.3		56.8	57.5	57.9	No	--	--	--	--	--	--	--
R 1.10.2		55.4	56.1	56.4	No	--	--	--	--	--	--	--
R 1.10.3		56.7	57.4	57.8	No	--	--	--	--	--	--	--
R 1.11.2		53.6	54.3	54.7	No	--	--	--	--	--	--	--
R 1.11.3		56.4	57.0	57.4	No	--	--	--	--	--	--	--
R 1.12		74.8	75.8	75.9	No	--	--	--	--	--	--	--
R 1.13		56.2	56.7	56.7	No	--	--	--	--	--	--	--
R 1.14		57.7	58.3	58.5	No	--	--	--	--	--	--	--
R 1.15	S114 Shoulder	62.5	63.1	63.2	No	60.1	59.9	59.5	58.5	58.1	Yes	No
R 1.16.1		65.5	66.0	66.3	Yes	63.0	62.6	61.8	60.4	59.8	Yes	No
R 1.16.2		67.9	68.4	68.3	Yes	65.5	64.4	63.5	62.3	61.2	Yes	Yes
R 1.16.3		70.0	70.5	70.6	Yes	68.0	66.0	64.9	63.6	62.8	Yes	Yes
R 1.16.4		70.7	71.2	71.4	Yes	69.0	68.6	66.4	65.3	63.7	Yes	Yes
R 1.17.1		68.9	69.4	69.6	Yes	65.6	65.1	64.2	62.9	62.3	Yes	Yes
R 1.17.2		71.0	71.5	71.4	Yes	67.8	66.9	66.1	65.1	64.3	Yes	Yes
R 1.17.3		72.5	73.0	73.0	Yes	70.5	69.0	68.0	66.7	66.1	Yes	Yes
R 1.17.4		72.9	73.4	73.5	Yes	71.3	70.9	70.1	68.3	67.0	Yes	No
R 1.18.1		70.7	71.1	71.3	Yes	66.5	66.1	65.3	64.0	63.5	Yes	Yes

Table 2.2.7-2. Noise Levels for Existing, No Build, and Build Alternative 2 (Preferred Alternative) – Segment 1

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)					Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	Feasible	Design Goal Achieved
R 1.18.2		72.5	73.0	72.9	Yes	68.9	68.2	67.2	66.2	65.4	Yes	Yes
R 1.18.3		73.4	73.8	74.0	Yes	71.6	70.7	68.9	67.6	66.8	Yes	Yes
R 1.18.4		73.7	74.2	74.3	Yes	72.4	71.9	71.3	69.7	68.2	Yes	No
R 1.19		71.8	72.2	72.3	Yes	68.1	67.1	66.6	65.4	64.9	Yes	Yes
R 1.20.1		69.9	70.3	70.5	Yes	65.7	65.2	64.1	63.5	63.1	Yes	Yes
R 1.20.2		71.5	71.9	71.9	Yes	67.9	66.9	66.4	65.4	64.9	Yes	Yes
R 1.20.3		72.5	73.0	73.0	Yes	70.2	68.7	67.7	66.9	66.4	Yes	No
R 1.20.4		73.0	73.5	73.7	Yes	71.6	71.2	69.4	68.5	67.3	Yes	No
R 1.21		69.6	70.0	70.3	Yes	65.4	64.8	63.8	63.3	62.8	Yes	Yes

Notes:
1) $L_{eq}(h)$ are A-weighted, peak-hour noise levels in decibels.
2) '-- indicates a barrier was not evaluated for these receivers.
3) * - Per the Highway Design Manual, the maximum height of a noise barrier should not exceed 14 feet when located 15 feet or less from edge of travel way.

Source: Noise Study Report, November 2016.

Table 2.2.7-3. Noise Levels for Existing, No Build, and Build Alternative 2 (Preferred Alternative) – Segment 2

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level Leq(h), dBA	Design Year Build Noise Level Leq(h), dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)					Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	Feasible	Design Goal Achieved
R 2.1	--	60.1	60.7	60.2	No	--	--	--	--	--	--	--
R 2.2		66.7	67.1	63.8	No	--	--	--	--	--	--	--
R 2.3.2		56.0	56.5	57.3	No	--	--	--	--	--	--	--
R 2.3.3		60.3	60.7	61.6	No	--	--	--	--	--	--	--
R 2.4.1		55.6	56.0	56.9	No	--	--	--	--	--	--	--
R 2.4.2		56.2	56.6	57.4	No	--	--	--	--	--	--	--
R 2.4.3		58.1	58.5	59.4	No	--	--	--	--	--	--	--
R 2.5		55.0	55.3	56.3	No	--	--	--	--	--	--	--
R 2.6.2		56.7	57.1	57.9	No	--	--	--	--	--	--	--
R 2.6.3		59.9	60.2	61.0	No	--	--	--	--	--	--	--
R 2.7		76.0	76.8	77.2	No	--	--	--	--	--	--	--
R 2.8		74.1	74.2	75.2	No	--	--	--	--	--	--	--

Notes:
1) $L_{eq}(h)$ are A-weighted, peak-hour noise levels in decibels.
2) '-- indicates a barrier was not evaluated for these receivers.

Source: Noise Study Report, November 2016.

Table 2.2.7-4. Noise Levels for Existing, No Build, and Build Alternative 2 (Preferred Alternative) – Segment 3

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)					Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	Feasible	Design Goal Achieved
R3.1	--	58.9	59.0	60.0	No	--	--	--	--	--	--	--
R3.2		62.7	62.9	63.6	No	--	--	--	--	--	--	--
R3.3		62.3	62.5	63.1	No	--	--	--	--	--	--	--
R3.4		63.4	63.5	64.1	No	--	--	--	--	--	--	--
R3.5		64.5	64.7	65.4	No	--	--	--	--	--	--	--
R3.6		64.5	64.7	65.3	No	--	--	--	--	--	--	--
R3.7		65.2	65.3	65.9	No	--	--	--	--	--	--	--
R3.8		64.3	64.4	65.2	No	--	--	--	--	--	--	--
R3.9		63.8	63.9	64.6	No	--	--	--	--	--	--	--
R 3.10	S228/Private Property	61.2	61.3	62.1	No	--	--	61.3	61.0	60.6	No	No
R 3.11.2		69.6	69.7	70.5	Yes	--	--	68.5	64.4	62.9	Yes	Yes
R 3.12.2		69.9	70.0	70.8	Yes	--	--	68.9	64.3	62.9	Yes	Yes
R 3.13		61.4	61.5	62.4	Yes	--	--	61.1	59.6	58.4	No	No
R 3.14.1	--	58.5	58.6	59.4	No	--	--	--	--	--	--	--
R 3.14.2		59.8	59.9	60.4	No	--	--	--	--	--	--	--
R 3.14.3		63.8	63.9	64.4	No	--	--	--	--	--	--	--
R 3.15		57.8	57.9	58.8	No	--	--	--	--	--	--	--
R 3.16		52.1	52.1	53.2	No	--	--	--	--	--	--	--
R 3.17		74.0	75.6	75.3	No	--	--	--	--	--	--	--
R 3.18		73.0	73.7	74.4	No	--	--	--	--	--	--	--

Notes:
1) $L_{eq}(h)$ are A-weighted, peak-hour noise levels in decibels.
2) '-- indicates a barrier was not evaluated for these receivers.

Source: Noise Study Report, November 2016.

Table 2.2.7-5. Noise Levels for Existing, No Build, and Build Alternative 2 (Preferred Alternative) – Segment 4

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)								Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	18-foot Wall	20-foot Wall	22-foot Wall	Feasible	Design Goal Achieved
R4.1	S255 / RW	67.0	67.2	67.7	Yes	67.2	64.7	63.5	62.6	62.0	61.5	61.0	60.6	Yes	Yes
R4.2		70.8	70.9	71.2	Yes	70.2	67.5	65.9	65.0	64.2	63.7	63.3	62.8	Yes	Yes
R4.3	SW271[X] / RW	67.8	67.9	68.0	Yes	--	--	--	--	66.4	65.5	64.6	63.8	No	No
R4.4		68.5	69.0	69.0	Yes	--	--	68.6	68.1	66.7	65.4	64.5	63.7	Yes	No
R4.5		67.1	67.8	68.0	Yes	--	--	67.2	66.2	65.4	64.6	63.9	63.2	No	No
R4.6		65.9	66.5	67.0	Yes	--	--	66.4	65.5	64.7	64.0	63.4	62.8	No	No
R4.7		66.1	66.9	67.0	Yes	--	--	66.5	65.9	65.3	64.8	64.3	63.9	No	No
R4.8		62.3	62.8	62.4	No	--	--	62.1	61.9	61.6	61.4	61.2	61.0	No	No
R4.9	SW311[X] / RW	60.5	61.0	60.9	No	--	--	60.7	60.4	60.2	59.9	59.7	59.4	No	No
R4.10		62.3	63.3	63.7	No	--	--	63.2	62.4	61.7	61.0	60.5	60.0	No	No
R4.11		64.0	64.6	65.1	No	--	--	64.6	63.7	62.9	62.2	61.6	60.9	No	No
R4.12		65.4	66.1	66.4	Yes	--	--	65.6	64.4	63.4	62.5	61.7	61.0	Yes	No
R4.13		65.2	65.9	66.2	Yes	--	--	65.5	64.5	63.6	62.7	61.9	61.1	Yes	No
R4.14		65.7	66.1	66.5	Yes	--	--	65.8	64.7	63.8	63.0	62.3	61.7	No	No
R4.15		64.6	65.3	65.8	No	--	--	65.0	64.0	63.0	62.2	61.4	60.8	Yes	No
R4.16		65.6	66.3	66.7	Yes	--	--	65.9	64.8	63.8	63.0	62.2	61.4	Yes	No
R4.17		67.1	67.7	68.1	Yes	--	--	67.3	66.5	65.6	64.9	64.2	63.6	No	No
R4.18		67.2	67.7	68.0	Yes	--	--	67.2	66.2	65.3	64.5	63.8	63.1	No	No
R4.19		65.2	65.8	66.2	Yes	--	--	65.6	64.7	64.0	63.4	62.8	62.2	No	No
R4.20		65.6	66.2	66.5	Yes	--	--	65.9	65.0	64.4	63.6	63.0	62.5	No	No
R4.21		66.6	67.2	67.5	Yes	--	--	66.6	65.6	64.8	64.1	63.3	62.7	No	No
R4.22		65.8	66.4	66.7	Yes	--	--	65.9	65.0	63.9	63.3	62.6	62.0	No	No
R4.23		65.6	66.2	66.5	Yes	--	--	65.8	65.0	64.1	63.3	62.9	62.3	No	No
R4.24	--	62.5	63.2	63.1	No	--	--	--	--	--	--	--	--	--	--
R4.25		62.5	63.2	63.6	No	--	--	--	--	--	--	--	--	--	--

Table 2.2.7-5. Noise Levels for Existing, No Build, and Build Alternative 2 (Preferred Alternative) – Segment 4

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)								Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	18-foot Wall	20-foot Wall	22-foot Wall	Feasible	Design Goal Achieved
R4.26	Private Property	62.8	62.8	63.4	No	63.2	63.1	63.3	63.0	63.0	63.0	62.9	62.9	No	No
R4.27		62.7	62.7	63.6	No	62.3	61.9	62.7	61.5	61.4	61.2	61.1	61.0	No	No
R4.28		61.2	61.2	62.1	No	61.2	60.9	61.1	60.2	59.9	59.5	59.2	59.0	No	No
R4.29.1		58.6	58.6	59.6	No	59.6	59.1	58.6	58.1	57.5	57.1	56.5	56.0	No	No
R4.29.2		65.1	65.0	66.3	Yes	63.9	62.3	61.2	60.2	59.5	58.7	57.9	57.3	Yes	Yes
R4.30.1		64.0	64.1	65.1	No	64.6	64.0	63.3	62.8	62.3	61.9	61.3	60.8	No	No
R4.30.2		73.4	73.3	74.4	Yes	71.1	68.5	66.8	65.6	64.6	63.7	62.8	62.1	Yes	Yes
R4.31.1		63.6	63.7	64.6	No	63.9	63.3	62.6	62.3	61.8	61.4	61.0	60.5	No	No
R4.31.2		69.7	69.8	70.7	Yes	68.4	67	65.2	64.7	63.7	62.9	62.1	61.4	Yes	Yes
R4.32.1		63.2	63.3	64.1	No	63.5	62.9	62.4	61.9	61.4	60.9	60.5	60.2	No	No
R4.32.2		67.9	68.0	68.9	Yes	67.3	66.0	64.8	63.9	62.9	62.1	61.6	60.8	Yes	Yes
R 4.33		64.0	64.2	65.0	No	64.2	63.5	62.9	62.5	61.9	61.4	61.0	60.5	No	No
R 4.34.1		62.6	62.9	63.6	No	63.1	62.6	62.1	61.6	61.2	60.8	60.4	60.1	No	No
R 4.34.2		68.7	68.8	69.8	Yes	67.7	66.5	65.5	64.8	63.6	62.9	62.2	61.6	Yes	Yes
R 4.35.1	S266 / Private Property	66.6	67.0	67.9	Yes	64.3	62.3	59.8	58.6	57.3	56.4	56.0	55.7	Yes	Yes
R 4.35.2		67.4	67.5	68.4	Yes	68.4	68.4	68.4	68.4	68.2	68.1	67.7	67.5	No	No
R 4.36	Private Property	69.1	69.5	70.3	Yes	67.2	65.4	64.6	63.5	62.6	61.8	61.1	60.6	Yes	Yes
R 4.37	--	63.3	63.9	64.4	No	--	--	--	--	--	--	--	--	--	--
R 4.38		63.1	63.5	64.0	No	--	--	--	--	--	--	--	--	--	--
R 4.39	Private Property	62.7	63.1	63.7	No	--	--	--	--	--	--	--	--	--	--
R 4.40		65.1	65.6	66.2	Yes	65.1	64.2	63.3	62.5	61.9	61.4	60.7	60.2	Yes	No
R 4.41		63.2	63.6	64.3	No	63.7	63.0	62.4	61.8	61.3	60.9	60.4	59.9	No	No
R 4.42		61.6	61.9	62.5	No	62.0	61.4	60.7	60.0	59.5	59.0	58.5	58.0	No	No
R 4.43		61.7	62.2	62.9	No	62.5	62.1	61.4	60.8	60.3	59.8	59.4	58.9	No	No
R 4.44	--	61.7	62.2	62.8	No	--	--	--	--	--	--	--	--	--	--
R 4.45		63.4	63.8	64.4	No	--	--	--	--	--	--	--	--	--	--
R 4.46	S322 / RW (Option 1)	63.2	63.6	64.4	No	61.8	60.9	60.5	60.2	60.0	60.1	60.2	60.2	No	No
R 4.47		62.8	63.2	63.9	No	61.4	60.3	59.5	58.9	58.7	58.5	58.3	58.2	Yes	No
R 4.48		65.0	65.4	66.1	Yes	63.3	61.8	60.6	59.8	59.3	58.7	58.2	57.9	Yes	Yes

Table 2.2.7-5. Noise Levels for Existing, No Build, and Build Alternative 2 (Preferred Alternative) – Segment 4

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)								Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	18-foot Wall	20-foot Wall	22-foot Wall	Feasible	Design Goal Achieved
R 4.49		64.2	64.6	65.2	No	62.7	61.2	60.0	59.1	58.7	59.1	59.0	59.3	Yes	No
R4.50.1		65.0	65.5	66.0	Yes	64.3	62.6	61.4	60.4	59.7	59.3	59.1	59.2	Yes	No
R4.50.2		73.7	74.3	74.7	Yes	73.6	71.9	70.2	68.7	67.5	66.2	65.3	64.5	Yes	Yes
R4.51		64.7	65.3	65.7	No	64.7	63.5	61.3	61.4	61.1	60.9	60.7	60.4	Yes	No
R4.52		62.0	62.5	63.0	No	62.4	61.5	61.0	61.2	61.6	61.4	61.3	61.3	No	No
R4.53		58.8	59.2	59.7	No	59.5	59.3	59.2	59.2	59.2	59.2	59.3	59.3	No	No
R 4.47	S322 /Private Property (Option 2)	62.8	63.2	63.9	No	61.4	60.3	59.5	58.9	58.7	58.5	58.3	58.2	Yes	No
R 4.48		65.0	65.4	66.1	Yes	64.9	63.9	63.0	62.3	61.7	61.1	60.7	60.1	Yes	No
R 4.49		64.2	64.6	65.2	No	64.3	63.4	62.8	62.2	61.6	61.1	60.6	60.2	Yes	No
R4.50.1		65.0	65.5	66.0	Yes	65.3	64.5	63.9	63.4	62.9	62.5	62.0	61.7	No	No
R4.50.2		73.7	74.3	74.7	Yes	71.3	69.5	68.3	67.3	66.4	65.7	65.2	64.7	Yes	Yes

Notes:
1) $L_{eq}(h)$ are A-weighted, peak-hour noise levels in decibels.
2) '-- indicates a barrier was not evaluated for these receivers.
3) X = existing soundwall
4) * - Per the Highway Design Manual, the maximum height of a noise barrier should not exceed 14 feet when located 15 feet or less from edge of travel way.

Source: Noise Study Report, November 2016.

Table 2.2.7-6. Noise Levels for Existing, No Build, and Build Alternative 2 (Preferred Alternative) – Segment 5

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)								Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	18-foot Wall	20-foot Wall	22-foot Wall	Feasible	Design Goal Achieved
R5.1	SW57[X] and SW91[X] /Private Property and SW31 /RW	60.7	60.9	61.2	No	--	--	--	--	--	--	--	--	--	--
R5.2		63.6	63.6	63.6	No	--	--	--	--	--	--	--	--	--	--
R5.3		65.8	65.8	65.6	No	--	--	--	--	--	--	--	--	--	--
R5.4.1		63.7	63.8	63.7	No	--	--	--	--	--	--	--	--	--	--
R5.4.2		65.8	65.8	65.8	No	--	--	--	--	--	--	--	--	--	--
R5.5.1		60.2	60.3	60.3	No	--	--	--	--	--	--	--	--	--	--
R5.5.2		62.3	62.4	62.4	No	--	--	--	--	--	--	--	--	--	--
R5.6	SW350[X] /RW	61.0	61.0	61.8	No	--	--	--	61.8	61.7	61.7	61.7	61.7	No	No
R5.7		61.1	61.1	62.1	No	--	--	--	62.1	61.6	61.2	60.9	60.9	No	No
R5.8		62.8	62.8	63.4	No	--	--	--	63.4	63.1	64.0	63.3	63.3	No	No
R5.9		66.8	66.7	67.0	Yes	--	--	--	67.0	66.1	65.2	64.6	64.6	No	No
R5.10		66.5	66.5	66.6	Yes	--	--	--	66.6	65.9	65.1	64.5	64.5	No	No
R5.11		65.0	65.2	65.9	No	--	--	--	65.9	66.2	65.3	64.2	64.2	No	No
R5.12		67.7	67.7	67.6	Yes	67.5	67.5	67.5	67.5	66.7	65.8	65.1	65.1	No	No
R5.13		66.3	66.4	67.0	Yes	67.0	66.9	66.9	66.8	65.7	66.1	65.1	65.1	No	No
R5.14		69.1	69.3	69.3	Yes	68.5	68.3	68.3	68.2	67.0	66.0	64.8	64.7	No	No
R5.15	RW	67.1	67.3	67.0	Yes	64.3	63.7	63	63.8	63.2	62.5	61.9	61.6	Yes	No
R5.15	RW[5]	67.1	67.3	67.0	Yes	64.3	63.7	63	63.8	63.4	62.8	62.2	61.3	Yes	No
R5.16	--	65.3	65.4	65.4	No	--	--	--	--	--	--	--	--	--	--
R5.17		66.0	66.1	66.2	No	--	--	--	--	--	--	--	--	--	--
R5.18		76.0	76.0	76.0	No	--	--	--	--	--	--	--	--	--	--
R5.19.2		79.7	79.7	79.7	No	--	--	--	--	--	--	--	--	--	--
R5.20		53.4	53.8	53.4	No	--	--	--	--	--	--	--	--	--	--
R5.21		65.7	66.0	65.8	No	--	--	--	--	--	--	--	--	--	--

Notes:
1) $L_{eq}(h)$ are A-weighted, peak-hour noise levels in decibels.
2) '-- indicates a barrier was not evaluated for these receivers.
3) X = existing soundwall
4) * - Per the Highway Design Manual, the maximum height of a noise barrier should not exceed 14 feet when located 15 feet or less from edge of travel way.
5) Optional Barrier Design for R5.15 (New Barrier Extension with SW350 maintaining existing height of 14 feet)

Source: Noise Study Report, November 2016.

Table 2.2.7-7. Noise Levels for Existing, No Build, and Build Alternative 2 (Preferred Alternative) – Segment 6

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)					Noise Abatement	
						14-foot Wall	16-foot Wall	18-foot Wall	20-foot Wall	22-foot Wall	Feasible	Design Goal Achieved
R 6.1.2	RW	70.1	70.2	70.6	No	70.5	67.5	64.1	62.3	61.0	Yes	Yes
R 6.1.4		73	73.1	73.5	No	73.5	73.5	73.5	73.4	73.4	No	No
R 6.2.2	S417 / RW	67	67.1	66.8	Yes	62.1	60.2	58.8	57.4	56.5	Yes	Yes
R 6.2.4		71.9	72.0	72.1	Yes	72.1	72.0	71.9	71.8	71.4	No	No
R 6.3.2		65.7	65.9	66.1	Yes	62.1	60.4	58.6	57.9	56.3	Yes	Yes
R 6.3.3		71.4	71.5	71.8	Yes	71.6	70.7	68.7	64.3	62.0	Yes	Yes
R 6.3.4		71.8	71.9	72	Yes	72	71.9	71.8	71.8	71.5	No	No
R 6.3.5		71.9	72.0	72.3	Yes	72.3	72.3	72.3	72.2	72.1	No	No
R 6.4.2		68.2	68.3	68.4	Yes	62.9	61.4	59.9	58.7	58.0	Yes	Yes
R 6.4.3		73.6	73.7	74.0	Yes	73.1	71.3	67.5	64.3	62.5	Yes	Yes
R 6.4.4		74.1	74.2	74.3	Yes	74.2	74.1	74.1	73.6	72.4	No	No
R 6.4.5		74.1	74.2	74.3	Yes	74.3	74.3	74.2	74.1	74.1	No	No
R 6.5.2		76.4	76.5	76.5	Yes	69.4	68.6	68.1	67.6	67.3	Yes	Yes
R 6.5.3		77.9	77.9	77.9	Yes	77	75.6	72.8	70.4	69.3	Yes	Yes
R 6.5.4		77.8	77.9	78.1	Yes	78	77.9	77.7	77.1	76.1	No	No
R 6.5.5		77.8	77.9	77.9	Yes	77.9	77.9	77.9	77.9	77.7	No	No
						8-foot Wall	**10-foot Wall**	**12-foot Wall**	**14-foot Wall**	**16-foot Wall**		
R6.6	--	68.5	68.7	68.7	No	--	--	--	--	--	--	--
R6.7		67.8	68.0	68.2	No	--	--	--	--	--	--	--
R6.8	Private Property	72.9	73.1	73.2	Yes	67.2	66.2	65.4	64.9	64.3	Yes	Yes
R6.9		73.7	73.9	73.9	Yes	68.6	67.6	66.8	66.3	65.9	Yes	Yes
R6.10	--	68.9	69.0	69.1	No	--	--	--	--	--	--	--

Notes:
1) $L_{eq}(h)$ are A-weighted, peak-hour noise levels in decibels.
2) '-- indicates a barrier was not evaluated for these receivers.

Source: Noise Study Report, November 2016.

Table 2.2.7-8. Noise Levels for Existing, No Build, and Build Alternative 2 (Preferred Alternative) – Segment 7

Receptor #	Barrier ID	Existing Noise Level (dBA)	Predicted Noise Level without Project (dBA)	Predicted Noise Level with Project (dBA)	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)					Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	Feasible	Design Goal Achieved
R7.1	RW	70.9	71.2	71.1	Yes	65.4	64.1	62.8	61.4	60.5	Yes	Yes
R7.2	--	67.1	67.4	67.6	No	--	--	--	--	--	--	--
R7.3		66.2	66.4	66.6	No	--	--	--	--	--	--	--

Notes:
1) $L_eq(h)$ are A-weighted, peak-hour noise levels in decibels.
2) '-- indicates a barrier was not evaluated for these receivers.

Source: Noise Study Report, November 2016.

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 1 of 20)

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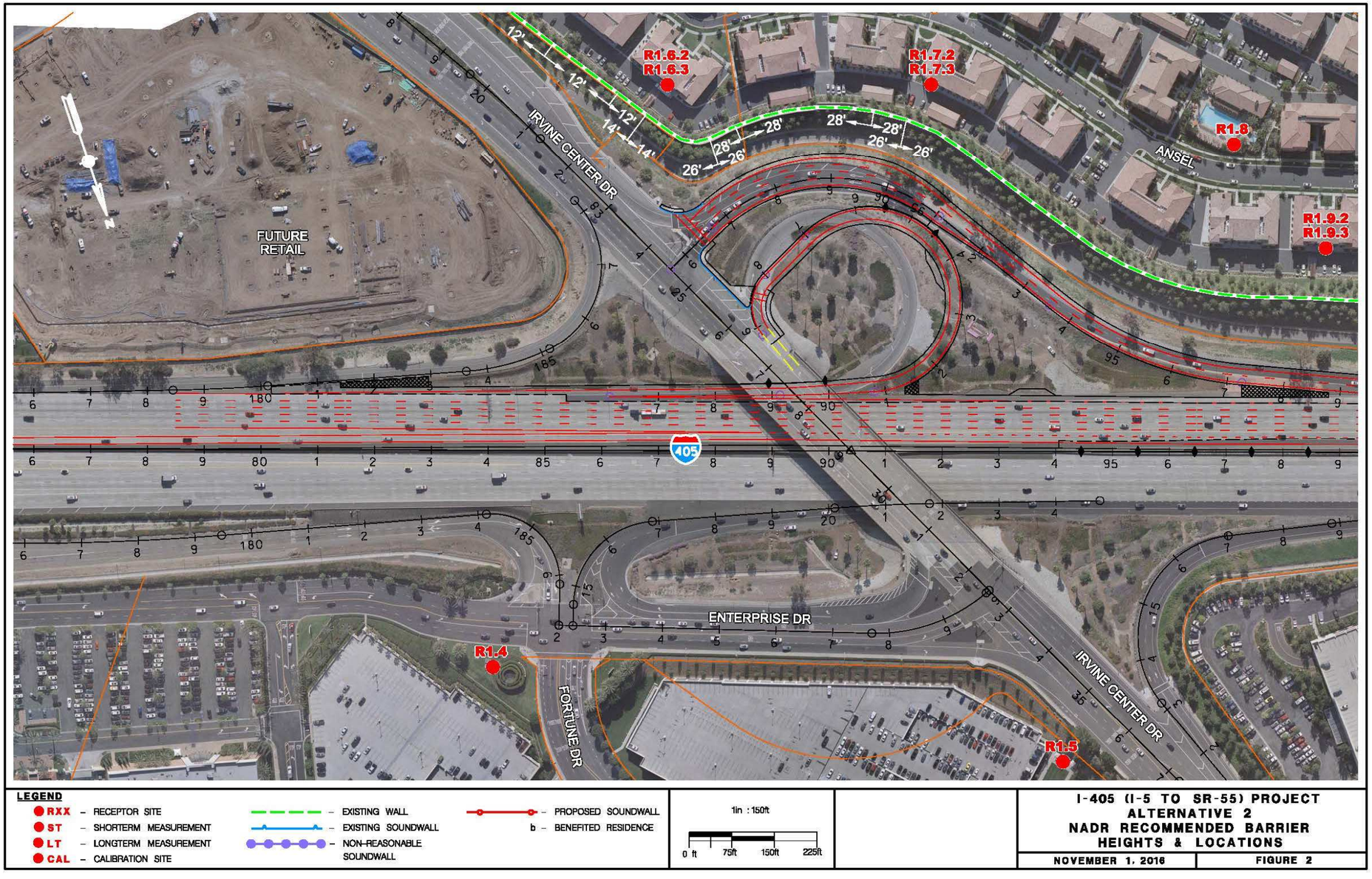

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 2 of 20)

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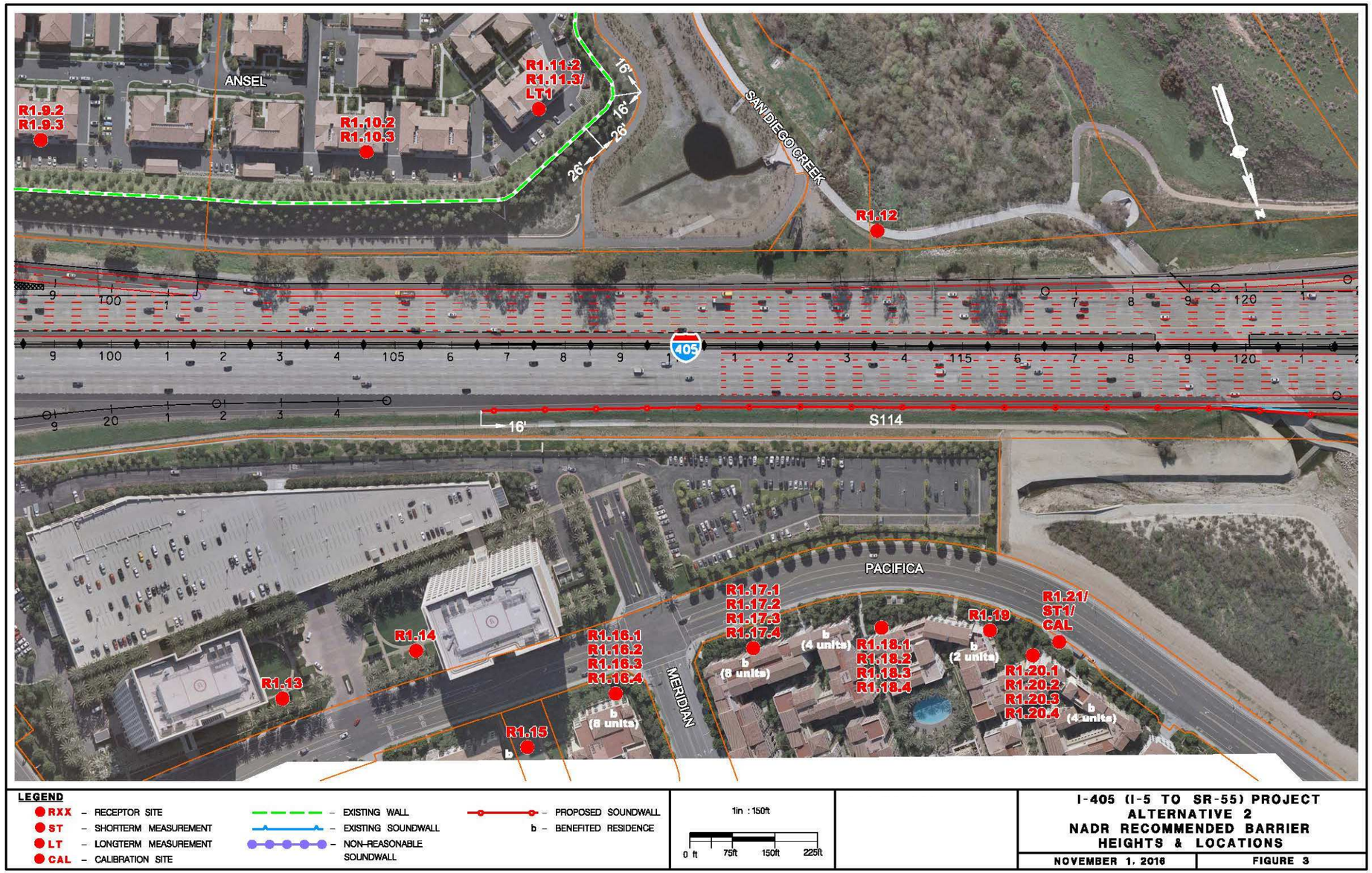

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 3 of 20)

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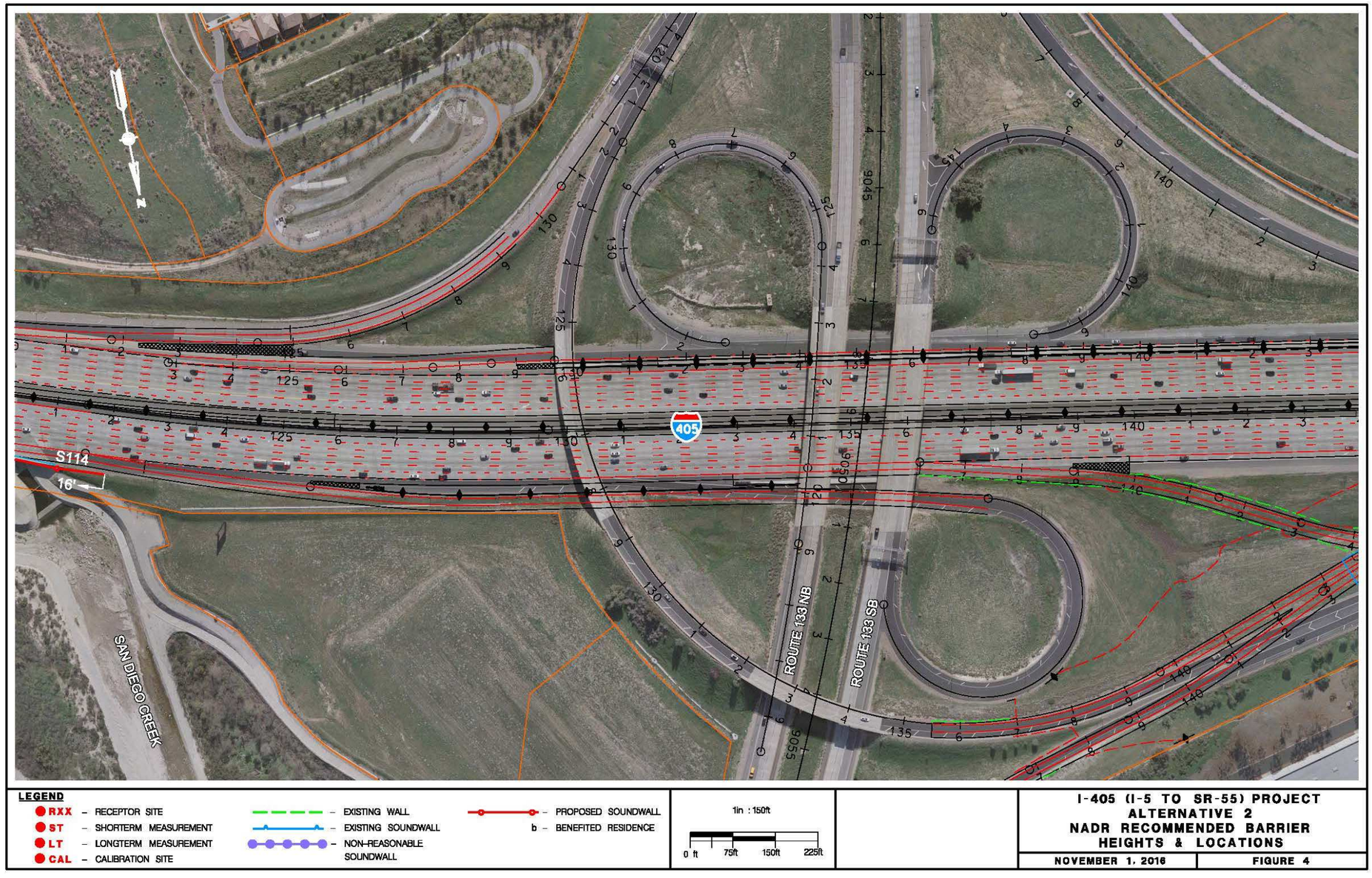

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 4 of 20)

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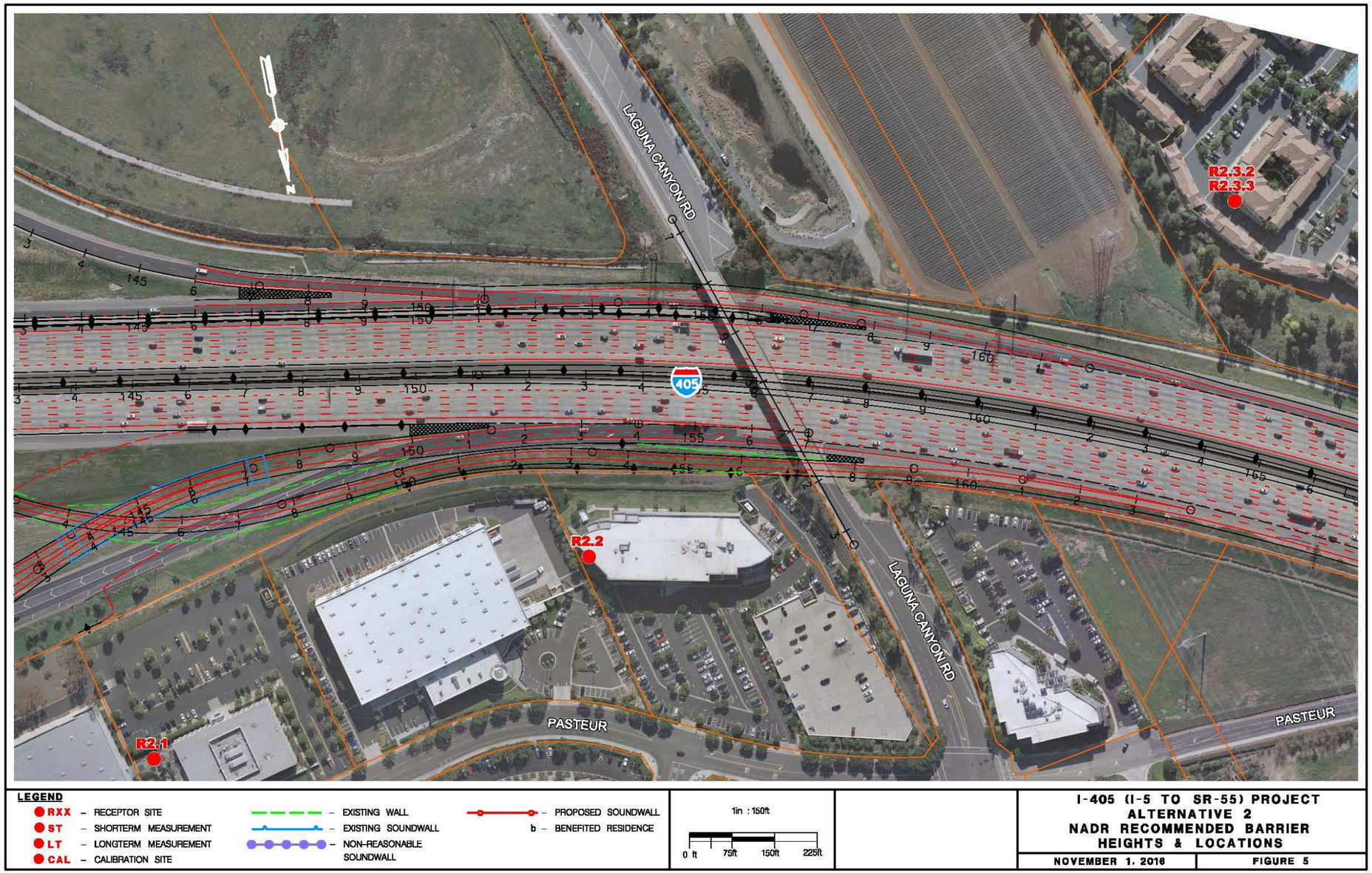

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 5 of 20)

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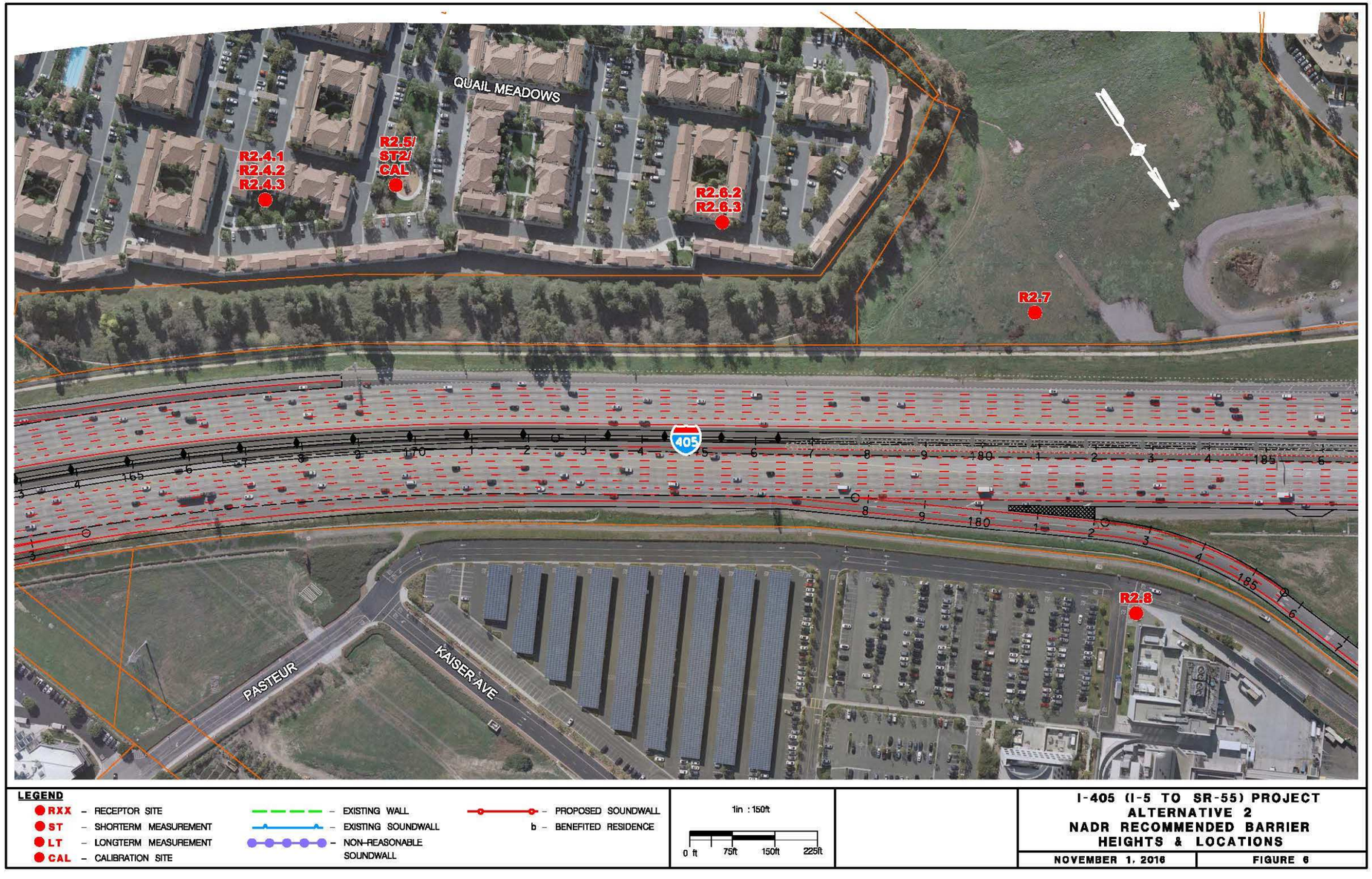

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 6 of 20)

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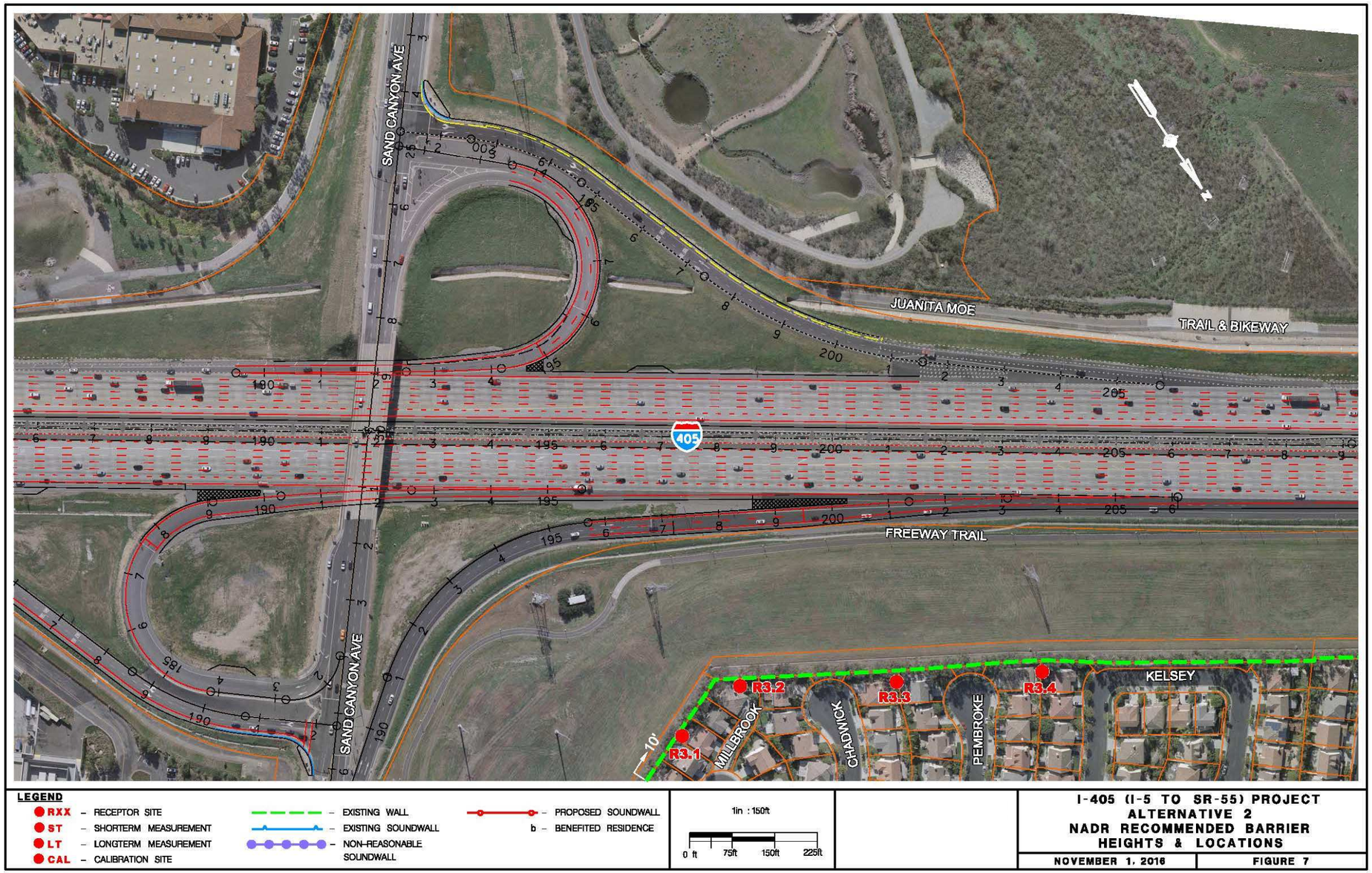

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 7 of 20)

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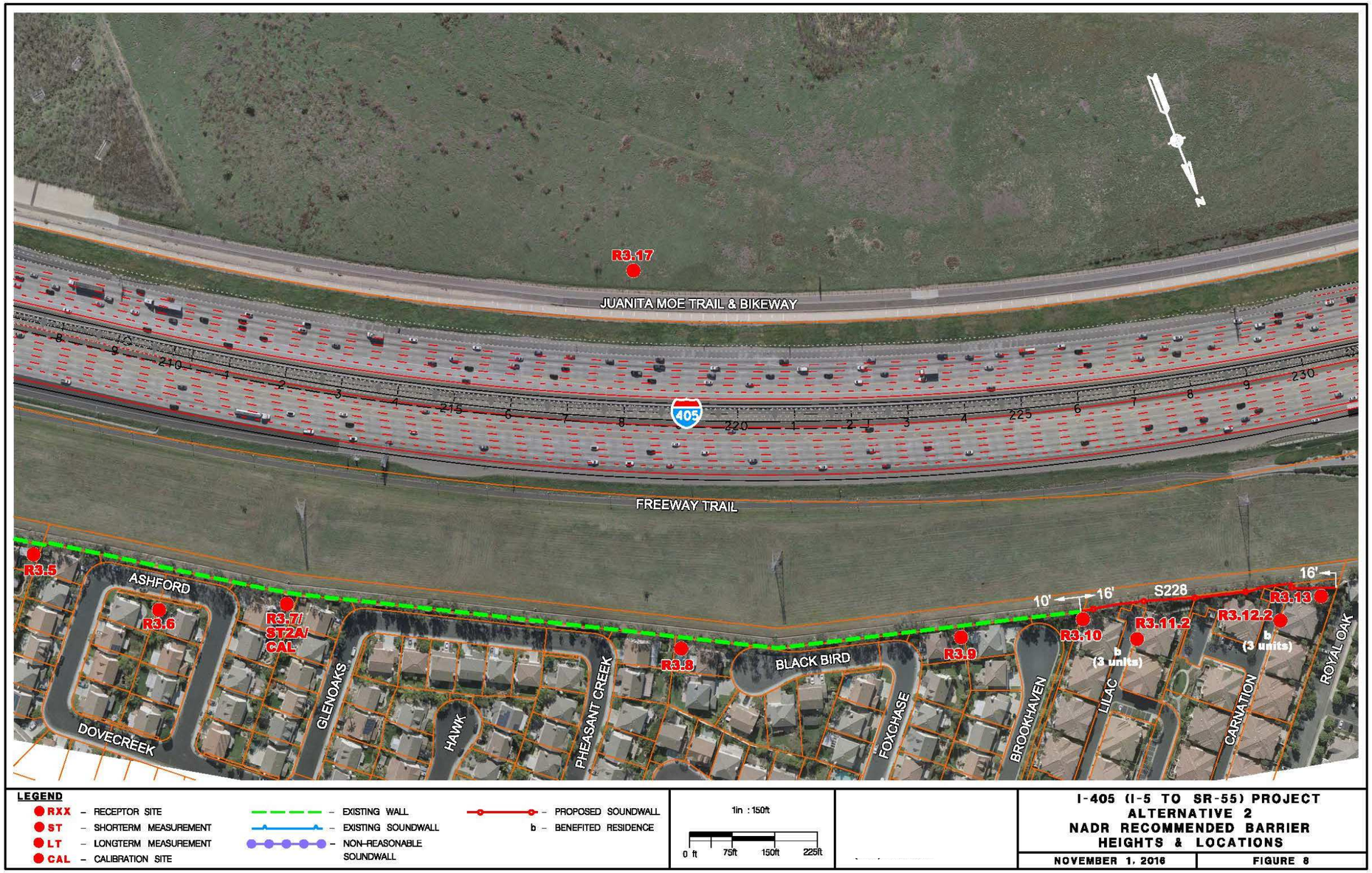

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 8 of 20)

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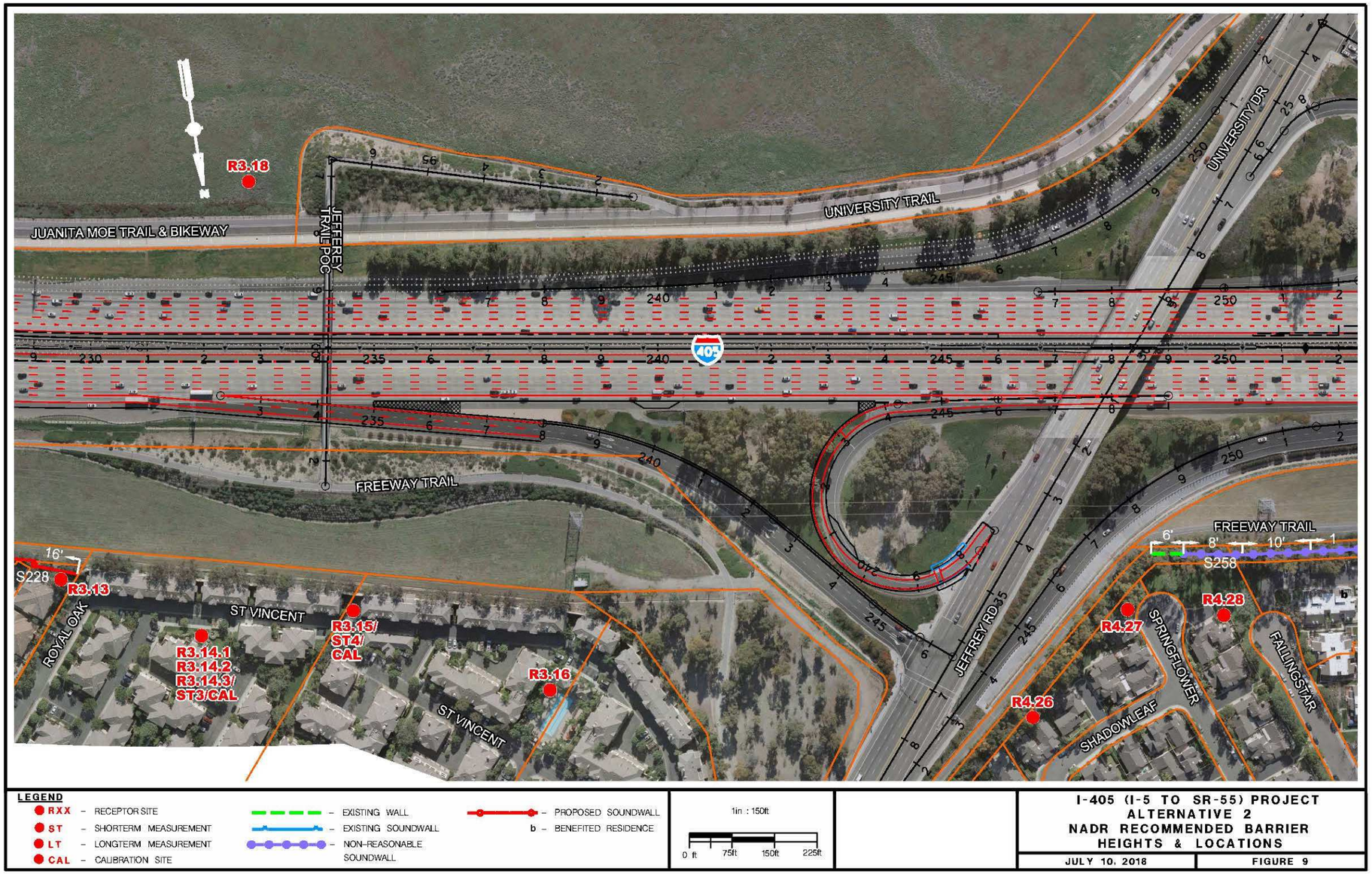

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 9 of 20)

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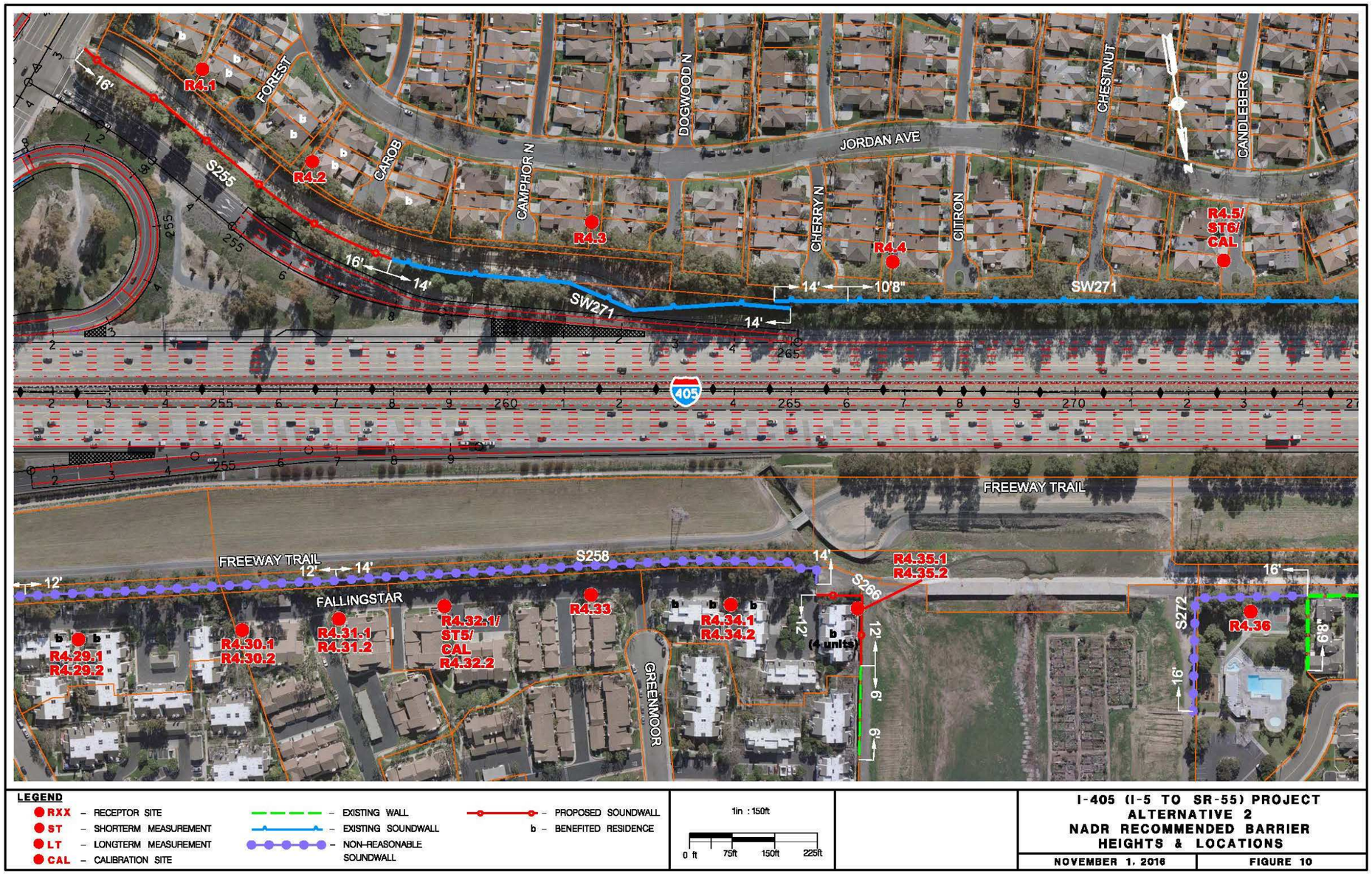

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 10 of 20)

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Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 11 of 20)

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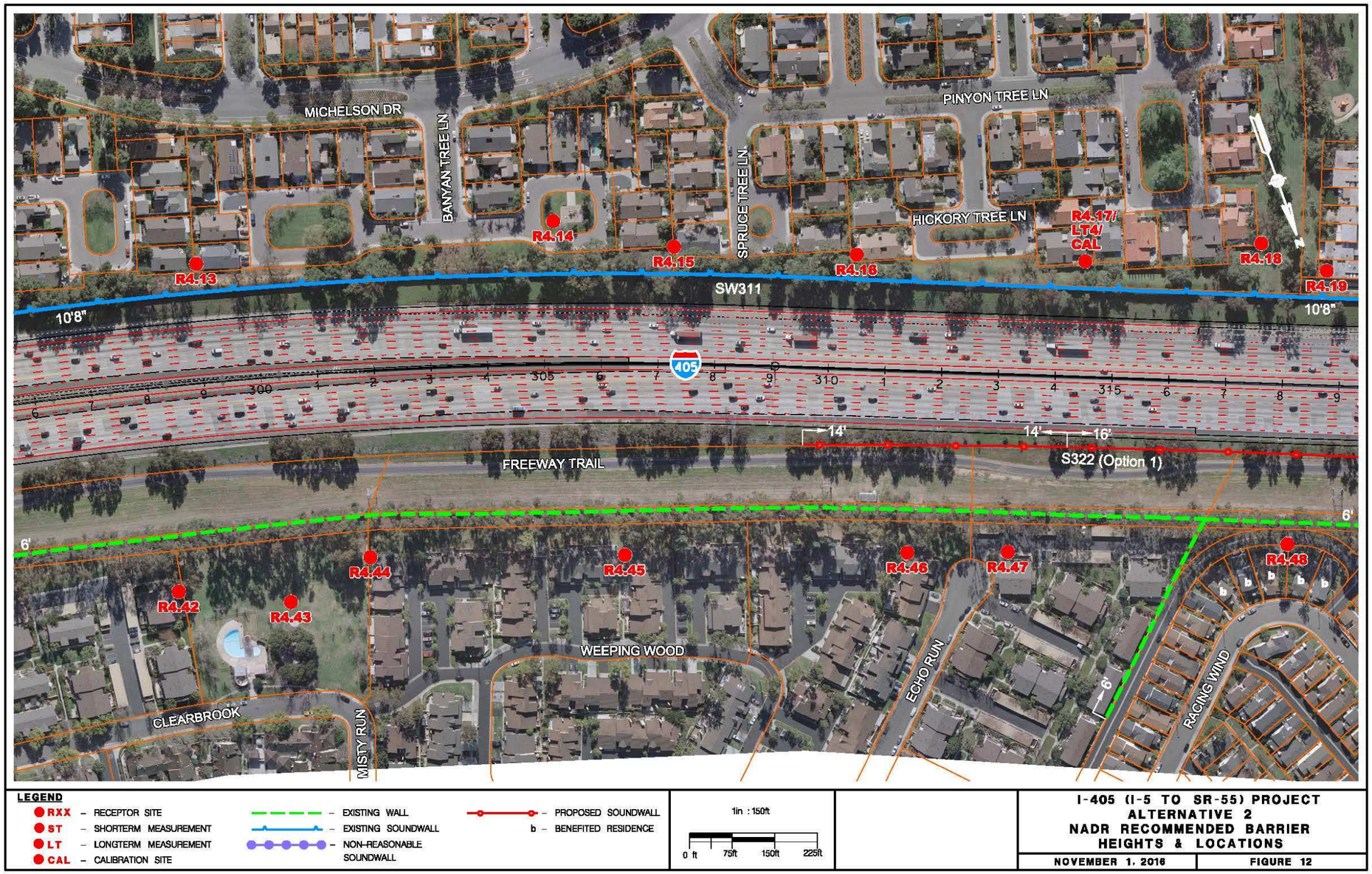

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 12 of 20)

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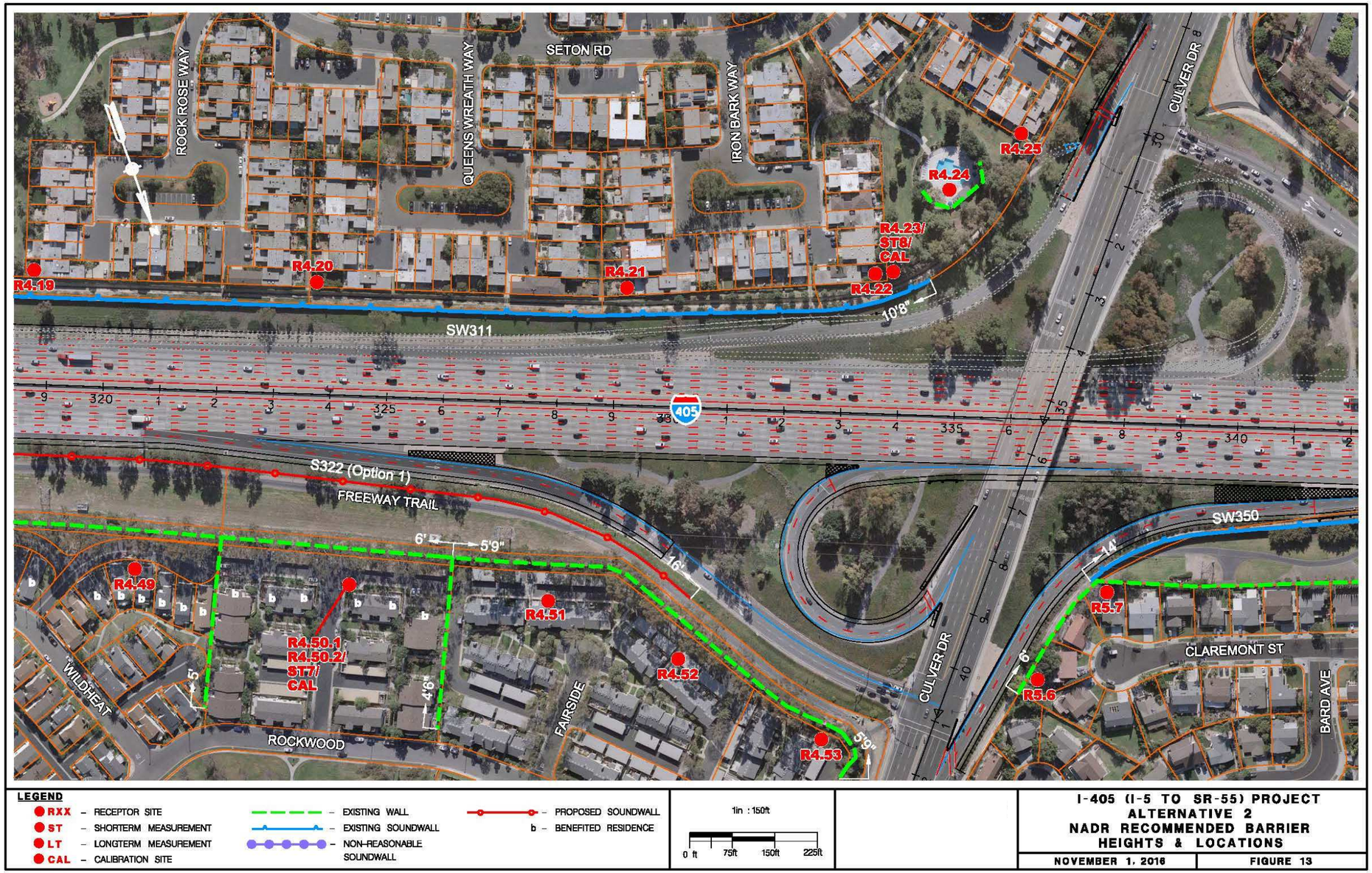

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 13 of 20)

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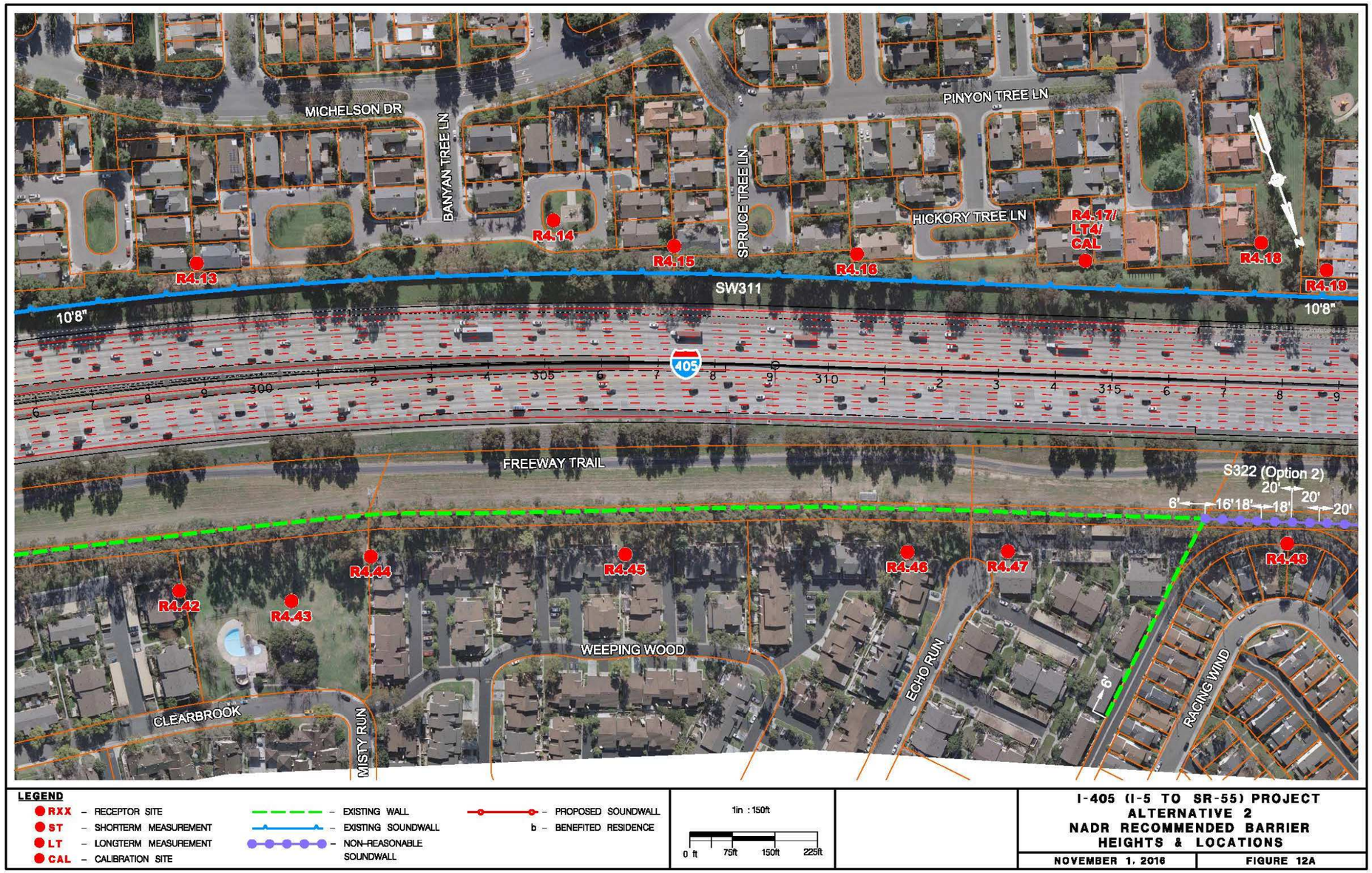

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 12A of 20)

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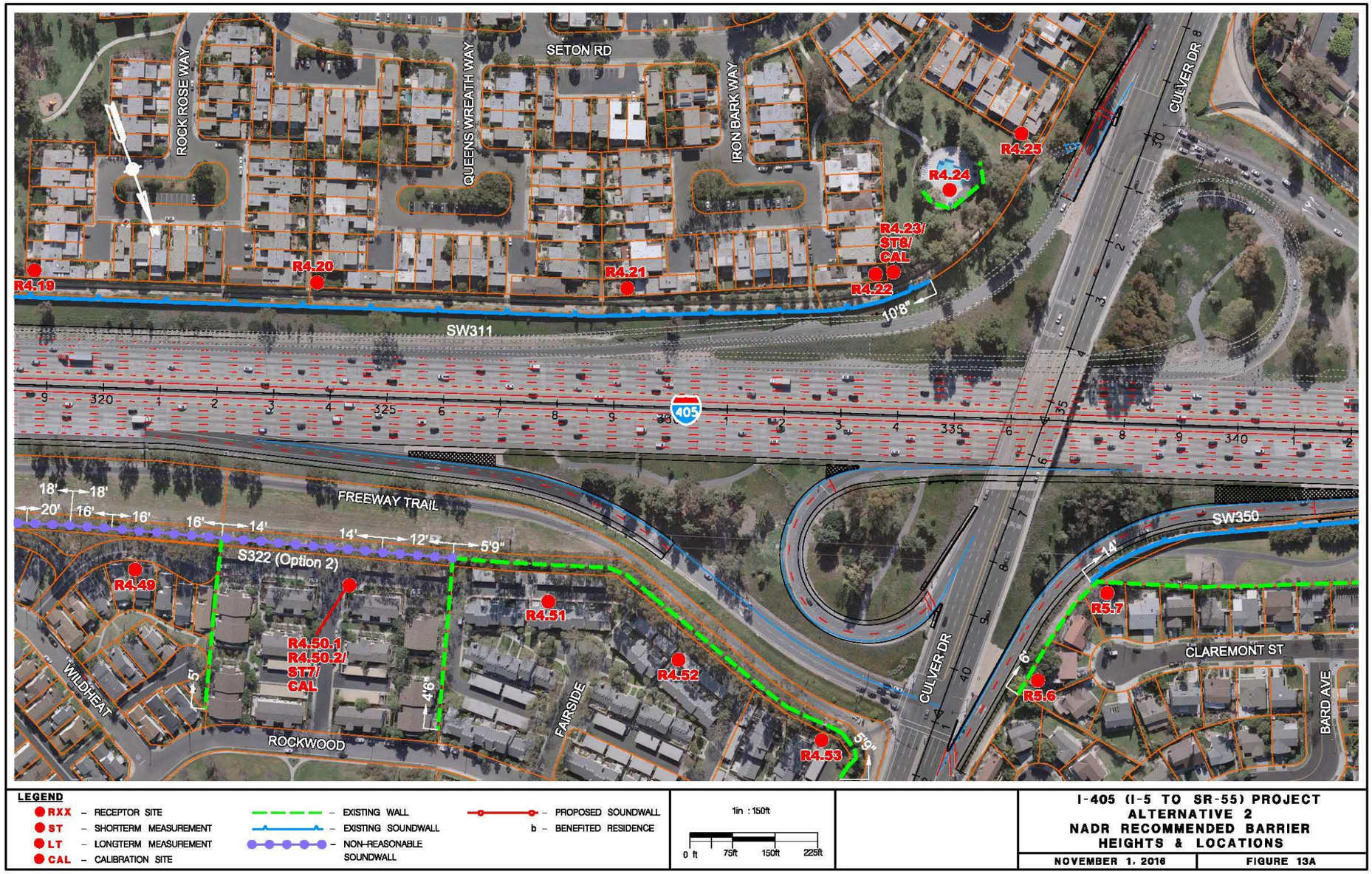

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 13A of 20)

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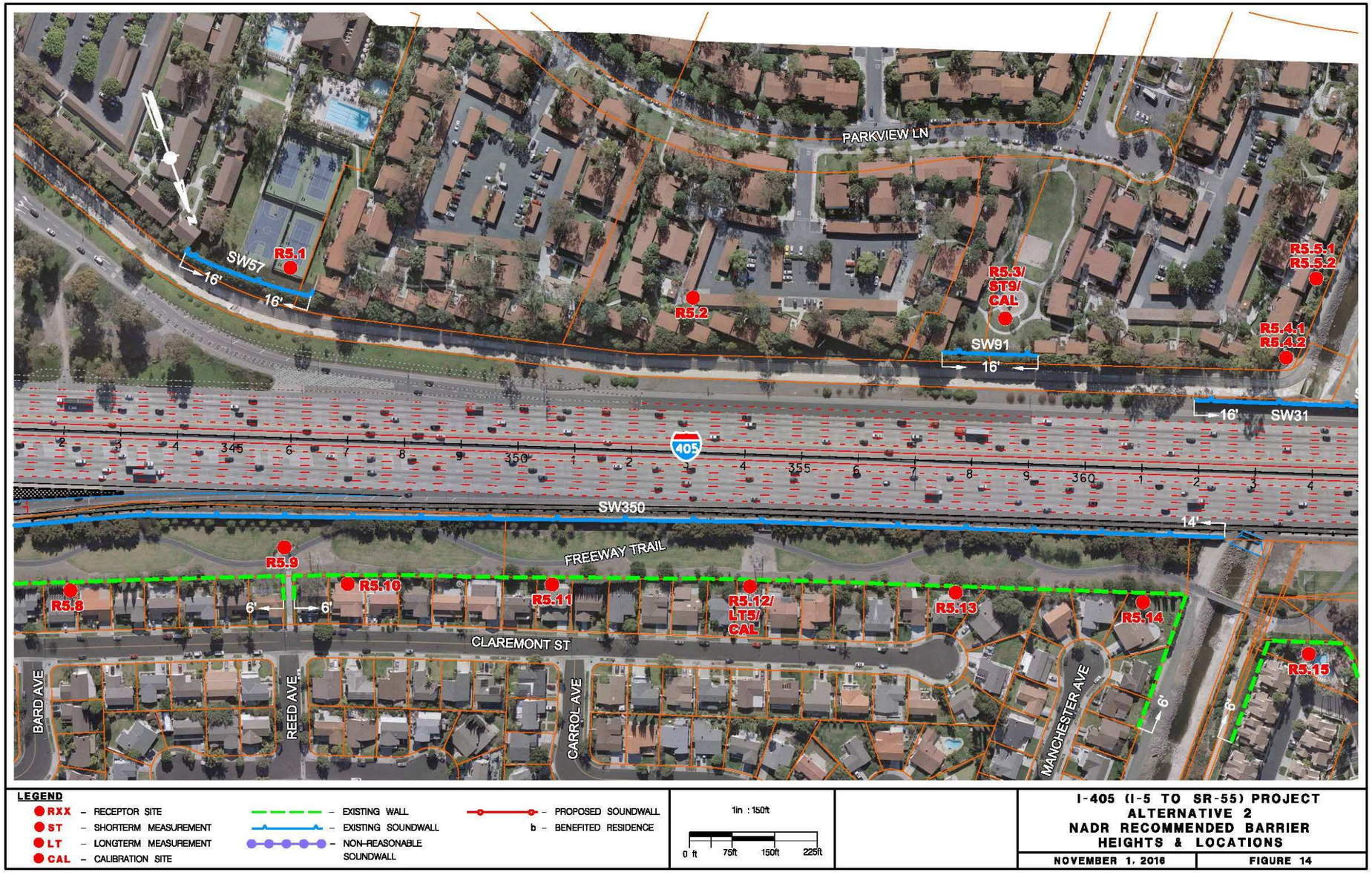

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 14 of 20)

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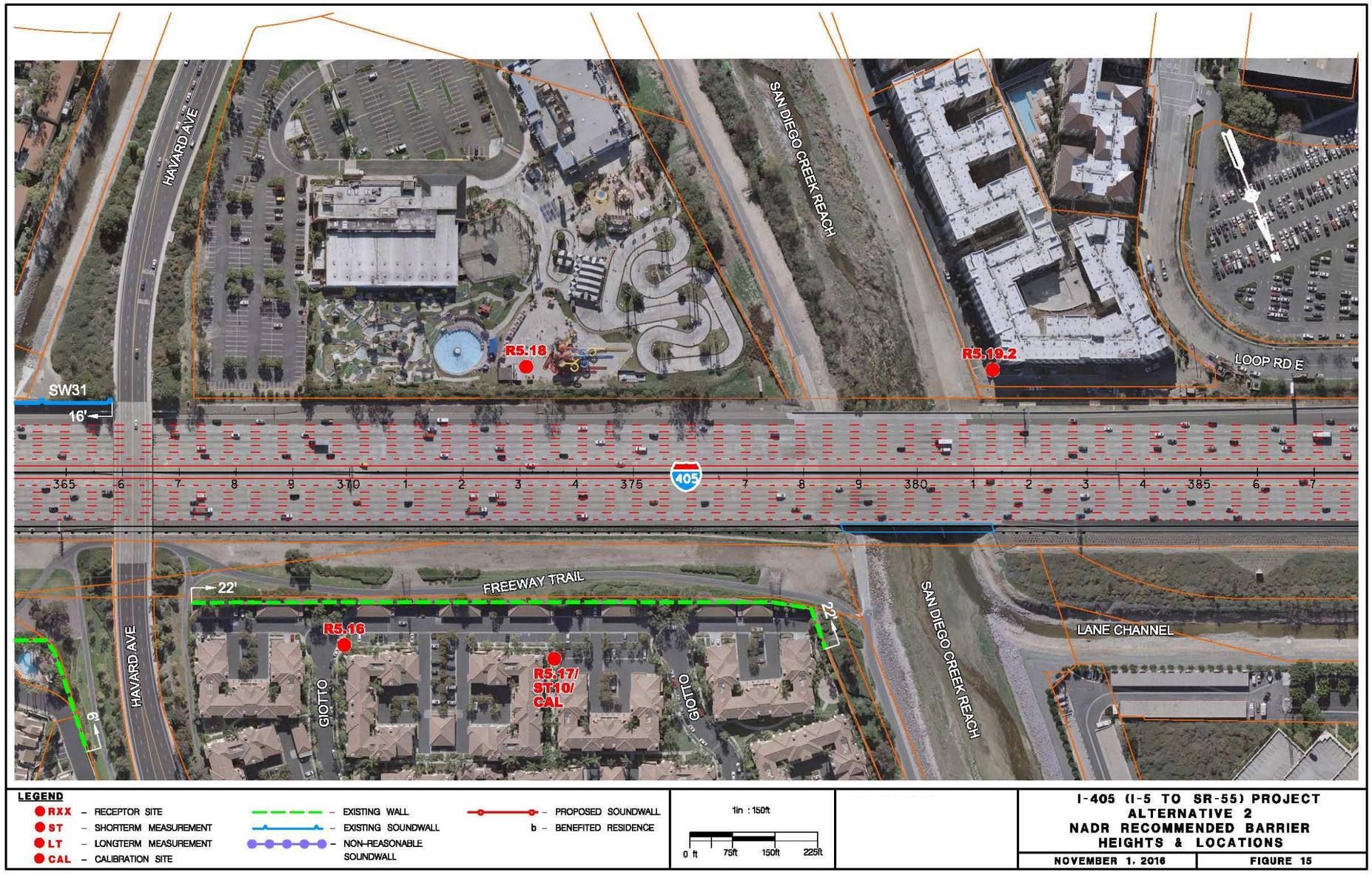

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 15 of 20)

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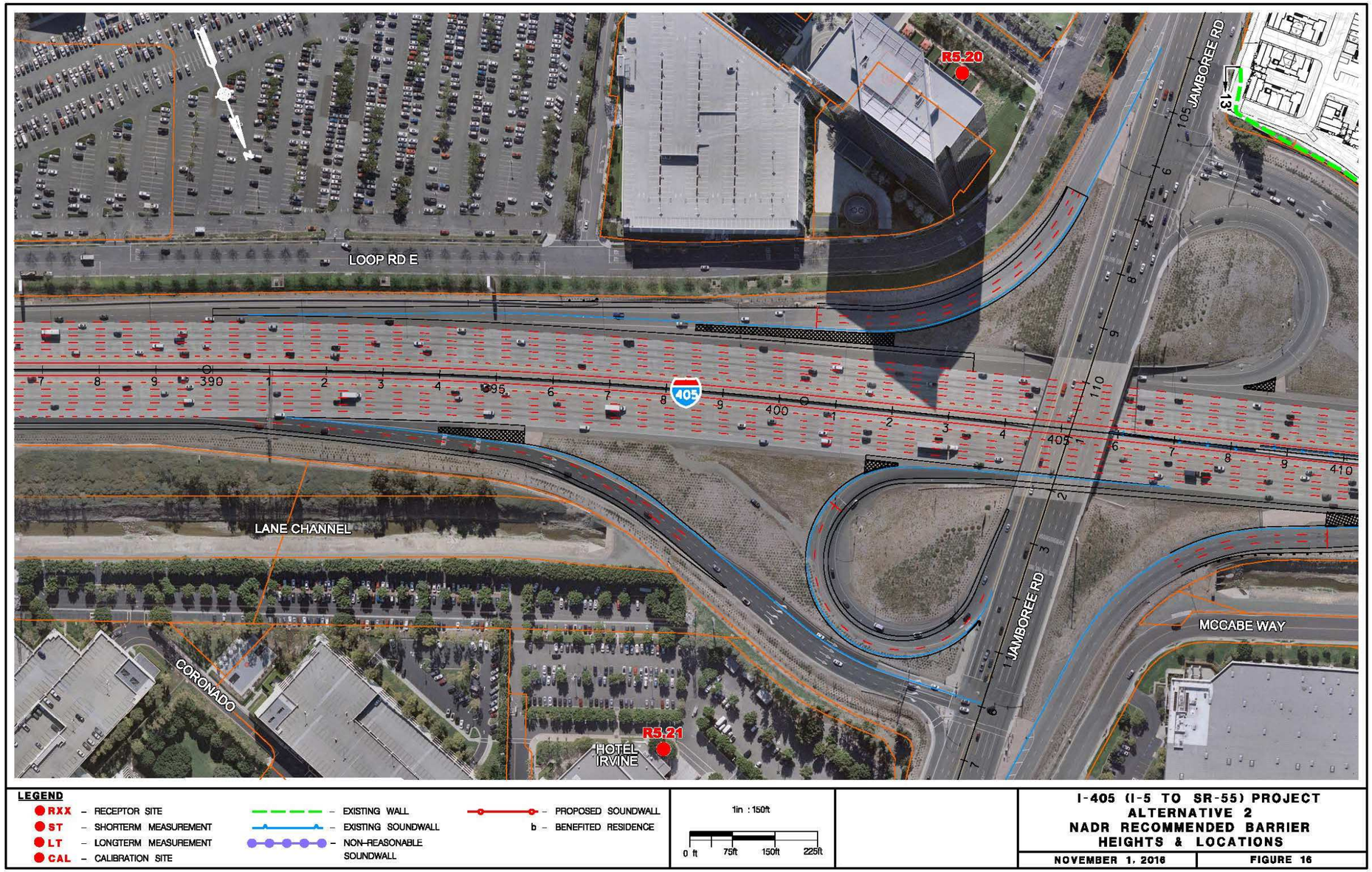

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 16 of 20)

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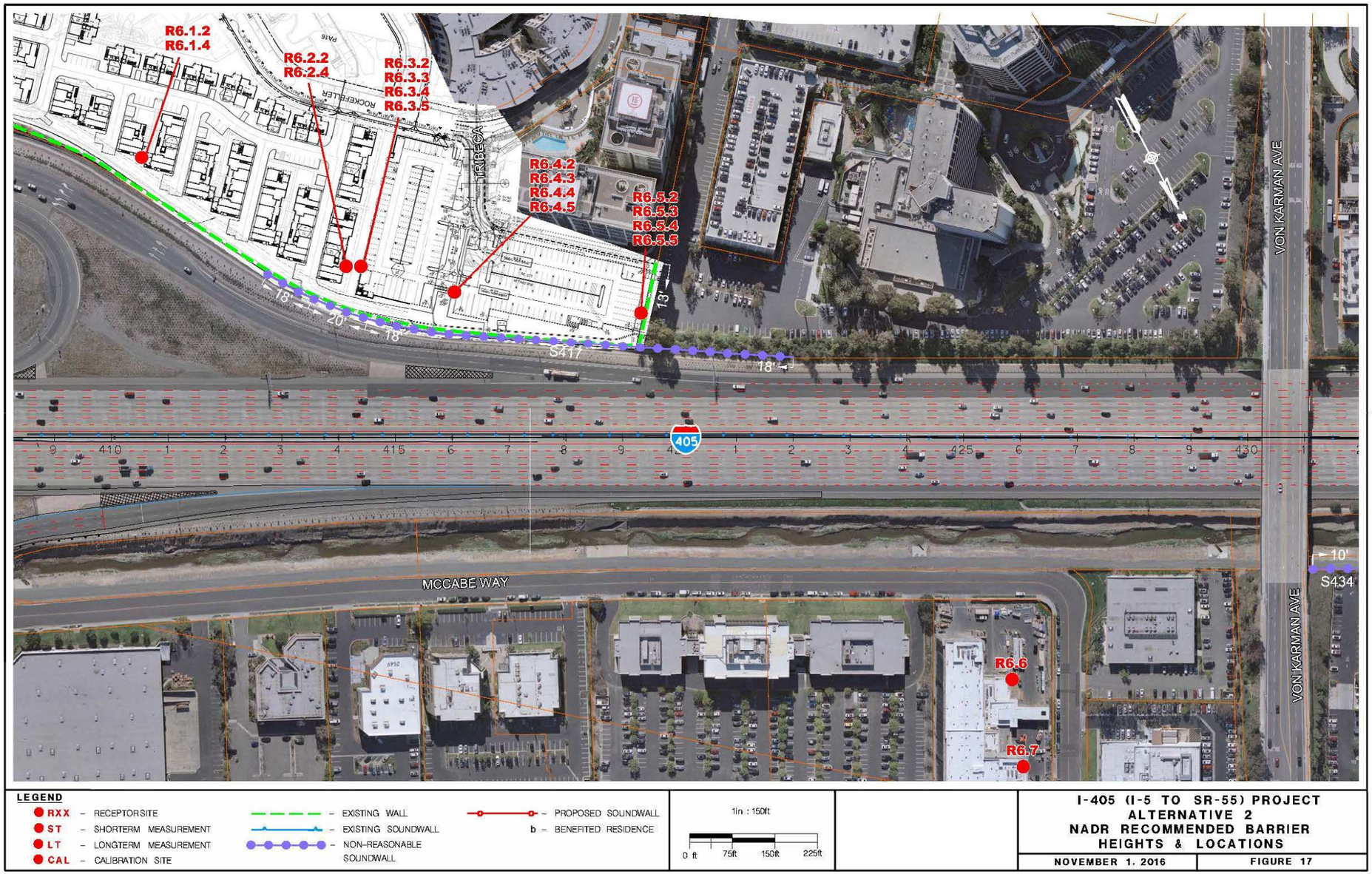

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 17 of 20)

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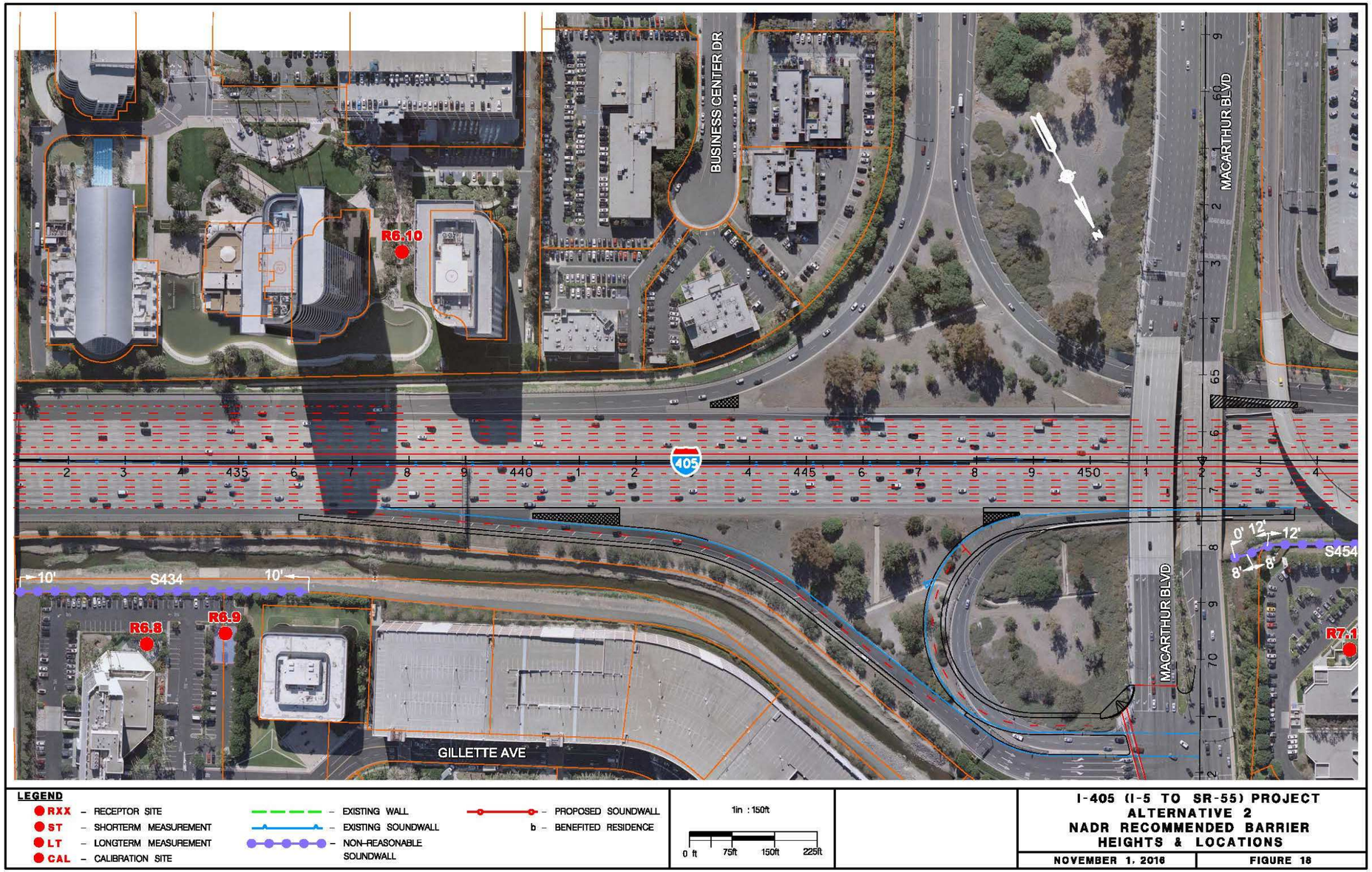

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 18 of 20)

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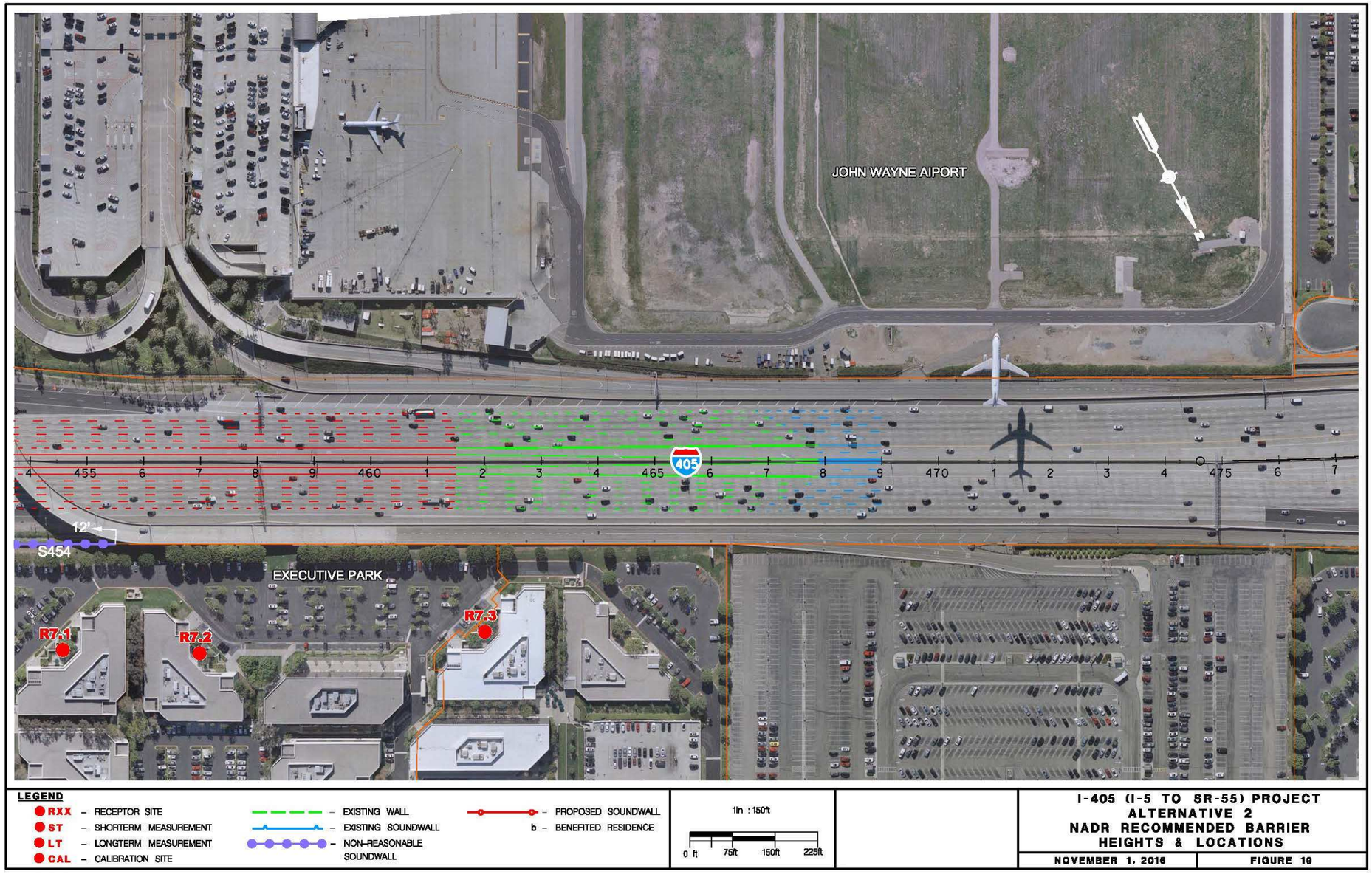

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 19 of 20)

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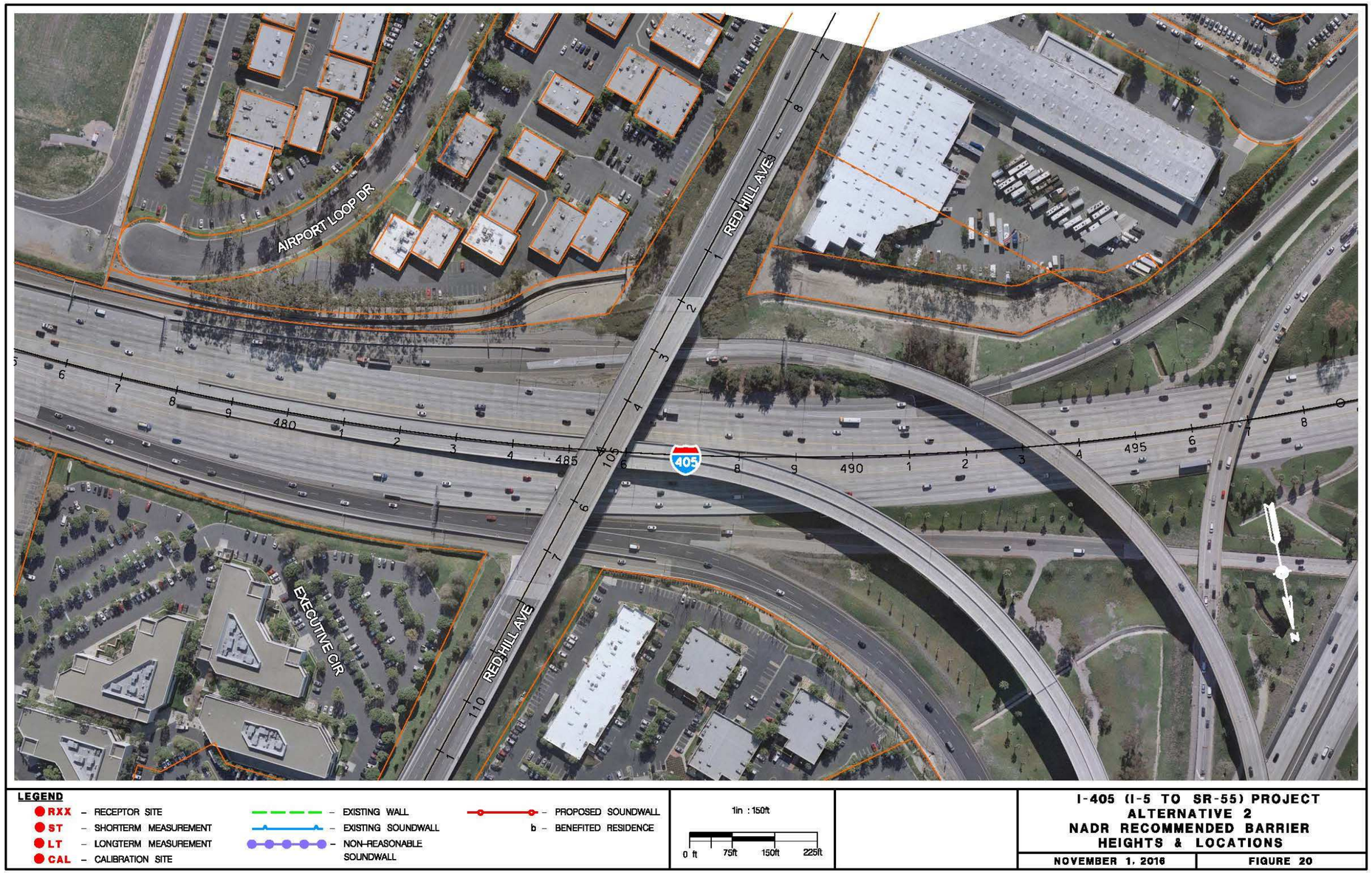

Figure 2.2.7-2. Recommended Barrier Height and Locations – Alternative 2 (Preferred Alternative) (Sheet 20 of 20)

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Table 2.2.7-9. Summary of Key Abatement Information (Alternative 2 [Preferred Alternative])

Barrier	Barrier Height	Feasible	Design Goal Achieved	Number of Benefited Receptors	Total Reasonable Allowance [R]	Estimated Construction Cost	Cost Less than Allowance
S114	8 feet	No	No	N/A	N/A	N/A	N/A
	10 feet	Yes	No	5	$400,000	$554,700	No
	12 feet	Yes	No	18	$1,440,000	$644,200	Yes
	14 feet	Yes	Yes	25	$2,000,000	$737,100	Yes
	16 feet	Yes	Yes	27	$2,160,000	$830,600	Yes
S228	12 feet	No	No	N/A	N/A	N/A	N/A
	14 feet	Yes	No	6	$480,000	$311,800	Yes
	16 feet	Yes	Yes	6	$480,000	$339,200	Yes
S255	8 feet	No	No	N/A	N/A	N/A	N/A
	10 feet	No	No	N/A	N/A	N/A	N/A
	12 feet	Yes	No	5	$400,000	$256,200	Yes
	14 feet	Yes	No	8	$640,000	$290,500	Yes
	16 feet	Yes	Yes	8	$640,000	$329,700	Yes
S266	8 feet	No	No	N/A	N/A	N/A	N/A
	10 feet	Yes	No	4	$320,000	$127,500	Yes
	12 feet	Yes	Yes	4	$320,000	$138,100	Yes
	14 feet	Yes	Yes	4	$320,000	$148,800	Yes
	16 feet	Yes	Yes	4	$320,000	$160,900	Yes

Table 2.2.7-9. Summary of Key Abatement Information (Alternative 2 [Preferred Alternative])

Barrier	Barrier Height	Feasible	Design Goal Achieved	Number of Benefited Receptors	Total Reasonable Allowance [R]	Estimated Construction Cost	Cost Less than Allowance
S322 (Option 1)	8 feet	No	No	N/A	N/A	N/A	N/A
	10 feet	No	No	N/A	N/A	N/A	N/A
	12 feet	Yes	No	11	$880,000	$1,075,000	No
	14 feet	Yes	No	17	$1,360,000	$1,186,000	Yes
	16 feet	Yes	Yes	23	$1,840,000	$1,312,000	Yes
	18 feet	Yes	Yes	23	$1,840,000	$1,470,000	Yes
	20 feet	Yes	Yes	33	$2,640,000	$1,706,000	Yes
	22 feet	Yes	Yes	33	$2,640,000	$1,786,000	Yes
	Design Barrier 14 and 16	Yes	Yes	23	$1,840,000	$1,285,000	Yes
S417	14 feet	Yes	Yes	3	$320,000	$734,200	No
	16 feet	Yes	Yes	5	$400,000	$790,400	No
	18 feet	Yes	Yes	5	$400,000	$860,500	No
	20 feet	Yes	Yes	5	$400,000	$965,300	No
	22 feet	Yes	Yes	5	$400,000	$1,001,000	No
	Design Barrier 18 and 20	Yes	Yes	5	$400,000	$872,000	No

Notes:
R = Reasonable Allowance is $80,000 per benefited residence.
Highlight = Recommended soundwall

Source: Noise Study Report, November 2016

Alternative 3

Twenty-two (22) noise barriers were evaluated for feasibility based on achievable noise reduction in the NSR for Alternative 3. Tables 2.2.7-10 through 2.2.7-16 show the existing, future, and barrier analysis noise levels for Alternative 3. Of the 22 barriers evaluated, 11 barriers met the design goal requirement of 7-dB insertion loss and were evaluated for reasonable cost allowance. Table 2.2.7-17 summarizes the range of allowances and construction costs for the feasible noise abatement measure considered, indicating that five walls were initially recommended for construction prior to the soundwall surveys. The recommended soundwall locations and heights are shown in Figure 2.2.7-3 (Sheets 1 through 20). The results are summarized below.

Segment 1 – I-5 to SR-133

Soundwall S114: Soundwall S114 was to be 1,550 feet long and located along the shoulder and ROW line of the NB lanes of I-405 between Irvine Center Drive and SR-133. This soundwall was to provide feasible noise abatement for the frequent outdoor use areas of 25 multi-family residences represented by Receptors R1.16.1 through R1.20.4.

Soundwall S114 met the 7-dB noise reduction design goal at 14 feet; however, at 16 feet, an additional five residential balcony outdoor use areas would achieve at least a 1-dB increase in traffic noise reduction. Therefore, with a total estimated construction cost of $830,600 for a wall height of 16 feet and a reasonableness allowance of $2,160,000, Soundwall S114 was considered reasonable due to cost and was recommended.

Soundwall S114 was later removed from further consideration based on completion of the residential viewpoint survey. Properties along the soundwall that would receive a 1 dB or more noise reduction were identified for the survey. Soundwall S114 is located within the State ROW; therefore, if more than 50 percent of the votes from responding benefited property owners oppose the noise abatement, the abatement will not be considered reasonable. Letters that are unclaimed or refused are removed from the consideration equation. Because Soundwall S114 is located within the State ROW, letters for which no response was received are counted as not opposing the soundwall and are removed from the consideration equation. Thirty (30) letters were sent. Soundwall S114 received 3 “yes” votes, 1 “no” vote, 16 unclaimed/refused letters, and 10 with no response. Therefore, the total number surveyed was 4. In this case, the “no” vote was from one owner who opposed the abatement and the three "yes" votes came from renters. Per Protocol, for non-owner-occupied dwelling units, the renter gets 10 percent of one vote and the owner gets 90 percent of one vote. Thus, per the protocol, the majority vote is in opposition, and Soundwall S114 is no longer considered reasonable from the viewpoint of the benefited receptors.

Segment 3 – Sand Canyon Avenue to Jeffrey Road/University Drive

Soundwall S228: Soundwall S228 was to be 460 feet long and located within private property along the NB lanes of I-405 between SR-133 and Jeffrey Road. Traffic noise impacts would occur at six second-story multi-family balconies located along NB I-405. Results of the barrier analysis concluded that a 16-foot-high soundwall would be needed to provide feasible abatement of traffic noise of 5 dB for the six impacted dwelling units and satisfy the 7-dB design goal.

The estimated total construction cost was calculated to be $339,200, and six benefited second-floor balconies would have provided a total reasonableness cost allowance of $480,000; therefore, this soundwall was considered reasonable due to cost, and it was recommended to be a 16-foot-high wall.

Soundwall S228 was later removed from further consideration based on completion of the residential viewpoint survey. Properties along the soundwall that would receive a 1 dB or more noise reduction were identified for the survey. Soundwall S228 would be located on private property. Per protocol, 100 percent of the owners of the private property upon which noise abatement is to be placed must support the proposed abatement. If no response is received from a property owner, their vote would be considered a "no" vote. Letters that are unclaimed or refused are removed from the consideration equation. Twenty-seven (27) letters were sent. Soundwall S228 received 14 "yes" votes, 1 "no" vote, 4 unclaimed/refused letters, and 8 no responses. Therefore, the total number surveyed was 15. Per the protocol, 100 percent of the owners did not support the proposed abatement. Therefore, Soundwall S228 is no longer considered reasonable from the viewpoint of the benefited receptors.

Areas with Existing Noise Abatement

Receptor R3.7: Traffic noise impacts would occur at two single-family residences located north of I-405 represented by Receptor R3.7. A soundwall, which would replace the existing property wall, was analyzed at heights up to 22 feet, and while impacted Receptor R3.7 would achieve the required 5-dB reduction of traffic noise levels, the design goal of 7 dB in traffic noise reduction could not be met. Therefore, the soundwall would not be considered reasonable.

Segment 4 – Jeffrey Road/University Drive to Culver Drive

Soundwall S255: Soundwall S255 would be 660 feet long and located on the ROW along the SB I-405 University Drive off-ramp. This soundwall would be 16 feet in height and meet the terminus of existing Soundwall SW271, which has a height of 14 feet at that location. This soundwall would provide feasible noise abatement for the frequent outdoor use areas of eight multi-family residences represented by Receptors R4.1 and R4.2.

The estimated total construction cost of $329,700 for this soundwall is less than the reasonable allowance of $640,000 and is considered reasonable due to cost. Soundwall S255 is feasible and reasonable, and it is recommended to be a 16-foot-high wall.

Properties along the soundwall that would receive a 1 dB or more noise reduction were identified for the survey. Soundwall S255 is located within the State ROW; therefore, if more than 50 percent of the votes from responding benefited property owners oppose the noise abatement, the abatement will not be considered reasonable. Letters that are unclaimed or refused are removed from the consideration equation. Because Soundwall S255 is located within the State ROW, letters for which no response was received are counted as not opposing the soundwall and are removed from the consideration equation. Twenty-four (24) letters were sent. Soundwall S255 received 15 "yes" votes, 0 "no" votes, 4 unclaimed/refused letters, and 4 with no response. Therefore, the total number surveyed was 14. Thus, per the protocol, the majority vote is in favor of the soundwall. Soundwall S255 is considered reasonable from the viewpoint of the benefited receptors.

Soundwall S266: Soundwall S266 was to be 204 feet long and located within private property along the NB I-405 traffic lanes between Jeffrey Road and Culver Drive. Results of the barrier analysis concluded that a 12-foot-high soundwall would be needed to provide feasible abatement of traffic noise of 5 dB and meet the 7-dB design goal at the ground floor receptor. The estimated total construction cost was calculated to be $138,100, and the four benefited outdoor use areas would provide a total reasonableness cost allowance of $320,000; therefore, this soundwall was considered reasonable due to cost. Soundwall S266 was feasible and reasonable, and it was recommended to be a 12-foot-high wall.

Soundwall S266 was later removed from further consideration based on completion of the residential viewpoint survey. Properties along the soundwall that would receive a 1 dB or more noise reduction were identified for the survey. Soundwall S266 would be located on private property. Per protocol, 100 percent of the owners of the private property upon which noise abatement is to be placed must support the proposed abatement. If no response is received from a property owner, their vote would be considered a "no" vote. Letters that are unclaimed or refused are removed from the consideration equation. Seven letters were sent. Soundwall S266 received 3 "yes" votes, 2 "no" vote, 1 unclaimed/refused letters, and 0 no responses. Therefore, the total number surveyed was 5. Per the protocol, 100 percent of the owners did not support the proposed abatement. Therefore, Soundwall S266 is no longer considered reasonable from the viewpoint of the benefited receptors.

Soundwall S322 (Options 1 and 2): Two soundwall locations were analyzed by the NSR for the impacted receptors in this area. Option 1 is located on the ROW with a length of 2,132 feet

and would be effective in reducing traffic noise levels for impacted and nonimpacted receptors. Option 2 would be 955 feet long, located within private property, and focused on providing abatement to impacted receptors only.

As shown in Table 3-2 of the NADR, only Option 1 attains enough benefited units to raise the total reasonableness allowances above the total estimated construction costs; therefore, the design barrier for Soundwall S322 Option 1 will be used. The total estimated construction cost is $658,300, which is less than the total reasonableness allowance of $2,640,000; therefore, this soundwall is considered reasonable due to cost, and it is recommended to be a 16- and 18-foot-high wall.

Properties along the soundwall that would receive a 1 dB or more noise reduction were identified for the survey. Soundwall 322 is located within the State ROW; therefore, if more than 50 percent of the votes from responding benefited property owners oppose the noise abatement, the abatement will not be considered reasonable. Letters that are unclaimed or refused are removed from the consideration equation. Because Soundwall S322 is located within the State ROW, letters for which no response was received is counted as not opposing the soundwall and are removed from the consideration equation. One hundred ninety-two (192) letters were sent. Soundwall S322 received 75 "yes" votes, 2 "no" votes, 30 unclaimed/refused letters, and 75 with no response. Therefore, the total number surveyed was 78. Thus, per the protocol, the majority vote is in favor of the soundwall. Soundwall S322 is considered reasonable from the viewpoint of the benefited receptors.

Areas with Existing Noise Abatement

Receptors R4.3 through R4.7: There is an existing soundwall system (Soundwall SW271) that consists of two consecutive walls, one located on the ROW along SB I-405 University Drive off-ramp and the other extending along the freeway ROW from SB I-405 University Drive off-ramp to the Yale Avenue pedestrian OC. The existing Soundwall SW271 along the ramp is 14 feet in height from approximately Stations 258+00 to 265+00. The existing Soundwall SW271 along the freeway ROW transitions from 14 feet to 10 feet 8 inches between Stations 265+00 and 266+00 and maintains a height of 10 feet 8 inches from Station 266+00 to 286+00. Receptor R4.4 was able to achieve feasible abatement and would require the existing soundwall to be replaced with one that is 22 feet in height. However, a taller noise barrier would not meet the design goal.

Receptors R4.12 through R4.23: Traffic noise impacts would occur at 48 frequent outdoor use areas represented by these receptors. The existing Soundwall SW311 is 10 feet 8 inches in height and located on the ROW along SB I-405 from the Yale Avenue pedestrian OC to the

SB Culver Drive on-ramp. Results of the barrier analysis concluded that a 22-foot-high soundwall would be needed to obtain at least a 5-dB reduction of traffic noise levels at any of the impacted outdoor use areas. However, none of the impacted or non-impacted receptors were able to meet the design goal of a 7-dB reduction of traffic noise levels. Therefore, noise abatement has not been considered for this area.

Receptors R4.29.2, R4.30.2, R4.31.2, R4.32.2, and R4.34.2: Traffic noise impacts would occur at eight second-story multi-family balconies located along NB I-405; however, the corresponding ground floor frequent outdoor use areas would not be impacted. Because the ground floor receptors are the primary concern of the traffic noise study and impacts at this area occur only at the second story, no additional noise abatement has been considered for these receptors.

Receptor R4.40: Traffic noise impacts would occur at one residential recreational use area represented by Receptor R4.40. There is an existing 6-foot-tall property wall on top of an earth berm located on private property. Results of the barrier analysis concluded that an 18-foot-high soundwall would be needed to obtain at least a 5-dB reduction of traffic noise levels at this location; however, the noise barrier was unable to meet the 7-dB design goal.

Segment 5 – Culver Drive to Jamboree Road

Areas with Existing Noise Abatement

Receptor R5.3: The playground of a multi-family residential complex would be impacted by traffic noise. An existing 16-foot-high Soundwall SW91, as well as the tall two-story apartment buildings, currently provide traffic noise abatement to this area. Results of the barrier analysis concluded that replacing the existing soundwall with one of a taller height would not provide feasible abatement.

Receptor R5.4.2: Traffic noise impacts would occur at two second-story multi-family balconies located along SB I-405. Existing 16-foot-high Soundwall SW31 is located on the shoulder of SB I-405 and protects this area from I-405 traffic noise. Ground floor patio areas represented by Receptor R5.4.1 would not be impacted. Results of the barrier analysis concluded that replacing the existing soundwall with one of a taller height or extending the existing soundwall would not provide feasible abatement.

Receptor R5.9: Traffic noise impacts would occur at a seating area along the Freeway Trail located north of I-405. This portion of the trail is protected by existing Soundwall SW350, which provides traffic noise abatement in this area. Replacing the existing 14-foot-high soundwall with a taller soundwall would not provide the minimum required 5-dB additional reduction of traffic noise levels; therefore, a taller soundwall would not be feasible.

Receptors R5.10 through R5.14: Traffic noise impacts would occur at 28 single-family residences located along NB I-405. In addition to the existing 14-foot-high Soundwall SW350 along the ROW, an existing 6-foot-high property wall located at the property line protects this area from I-405 traffic noise. The existing soundwall begins along the NB I-405 Culver Drive on-ramp and ends at the San Diego Creek channel. Results of the barrier analysis concluded that extending the length of the soundwall beyond the channel or replacing the existing soundwall at a taller height would not provide feasible abatement.

Receptor R5.15: The community pool area and patio of a single-family residence would be impacted by traffic noise levels. Barrier analysis concluded that extending the length of the existing 14-foot-high Soundwall SW350 beyond the San Diego Creek channel or replacing the existing soundwall with a taller soundwall would not meet the requirements for the feasible 5-dB additional reduction of traffic noise levels.

Receptor R5.17: Two units of a multi-family development were impacted by traffic noise levels; however, there is already an existing 22-foot-high wall located at the property line that protects this complex. Therefore, additional abatement could not be provided.

Segment 6 – Jamboree Road to MacArthur Boulevard

Soundwall S417: Soundwall S417 was to be 946 feet long and located on the ROW along the SB I-405 Jamboree Road off-ramp. Building plans indicated that the developer is providing traffic noise abatement by building a 13-foot-high property wall along the northern property line and ROW. Traffic noise level analysis conducted for this area assumed that the property wall will be built as shown in the builder's plans; however, with the 13-foot-high property wall, traffic noise would exceed the NAC for Activity Category B for Receptors R6.2.2 through R6.5.5, which represent the balconies of the planned building. Results of the barrier analysis concluded that constructing a soundwall at the ROW line would have provided feasible abatement for some of the impacted balconies. The total reasonable allowance for the proposed 18- and 20-foot design barrier benefiting 10 residents is $800,000. The estimated total construction cost of the design barrier is $872,000, which is more than the total reasonable allowance; however, the wall may have been considered as part of the project if the margin between the total reasonable allowance and the estimated construction cost diminished upon evaluation of the final built condition of the development.

Table 2.2.7-10. Noise Levels for Existing, No Build, and Build Alternative 3 – Segment 1

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)					Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	Feasible	Design Goal Achieved
R 1.1	--	68.8	70.0	70.0	No	--	--	--	--	--	--	--
R 1.2		61.0	62.0	62.0	No	--	--	--	--	--	--	--
R 1.3		71.5	71.9	72.0	No	--	--	--	--	--	--	--
R 1.4		70.3	70.8	70.8	No	--	--	--	--	--	--	--
R 1.5		56.9	57.5	57.5	No	--	--	--	--	--	--	--
R 1.6.2		53.5	54.2	54.3	No	--	--	--	--	--	--	--
R 1.6.3		64.3	65.0	65.3	No	--	--	--	--	--	--	--
R 1.7.2		51.8	52.5	52.9	No	--	--	--	--	--	--	--
R 1.7.3		54.8	55.5	55.8	No	--	--	--	--	--	--	--
R 1.8		52.6	53.3	53.7	No	--	--	--	--	--	--	--
R 1.9.2		55.3	56.0	56.4	No	--	--	--	--	--	--	--
R 1.9.3		56.8	57.5	57.9	No	--	--	--	--	--	--	--
R 1.10.2		55.4	56.1	56.5	No	--	--	--	--	--	--	--
R 1.10.3		56.7	57.4	57.8	No	--	--	--	--	--	--	--
R 1.11.2		53.6	54.3	54.7	No	--	--	--	--	--	--	--
R 1.11.3		56.4	57.0	57.4	No	--	--	--	--	--	--	--
R 1.12		74.8	75.8	76.0	No	--	--	--	--	--	--	--
R 1.13		56.2	56.7	56.8	No	--	--	--	--	--	--	--
R 1.14		57.7	58.3	58.6	No	--	--	--	--	--	--	--
R 1.15	S114 Shoulder	62.5	63.1	63.2	No	60.2	60.0	59.6	58.6	58.3	No	No
R 1.16.1		65.5	66.0	66.2	Yes	63.0	62.7	61.9	60.5	59.9	Yes	No
R 1.16.2		67.9	68.4	68.2	Yes	65.5	64.4	63.6	62.4	61.4	Yes	No
R 1.16.3		70.0	70.5	70.5	Yes	68.0	66.1	65.0	63.6	63.0	Yes	Yes
R 1.16.4		70.7	71.2	71.4	Yes	69.0	68.6	66.5	65.4	63.9	Yes	Yes
R 1.17.1		68.9	69.4	69.5	Yes	65.7	65.1	64.3	63.0	62.4	Yes	Yes
R 1.17.2		71.0	71.5	71.3	Yes	67.8	66.9	66.1	65.2	64.3	Yes	Yes
R 1.17.3		72.5	73.0	73.0	Yes	70.5	69.1	68.0	66.8	66.2	Yes	No
R 1.17.4		72.9	73.4	73.5	Yes	71.4	70.9	70.1	68.3	67.1	Yes	No
R 1.18.1		70.7	71.1	71.2	Yes	66.6	66.1	65.4	64.2	63.6	Yes	Yes
R 1.18.2		72.5	73.0	72.8	Yes	68.9	68.3	67.2	66.3	65.5	Yes	Yes

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)					Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	Feasible	Design Goal Achieved
R 1.18.3		73.4	73.8	74.0	Yes	71.6	70.8	68.9	67.7	67.0	Yes	Yes
R 1.18.4		73.7	74.2	74.3	Yes	72.5	71.9	71.4	69.8	68.3	Yes	No
R 1.19		71.8	72.2	72.2	Yes	68.2	67.2	66.7	65.6	65.1	Yes	Yes
R 1.20.1		69.9	70.3	70.3	Yes	65.8	65.3	64.2	63.7	63.3	Yes	Yes
R 1.20.2		71.5	71.9	71.9	Yes	68.0	67.1	66.6	65.6	65.2	Yes	No
R 1.20.3		72.5	73.0	73.1	Yes	70.4	68.8	67.9	67.1	66.6	Yes	No
R 1.20.4		73.0	73.5	73.8	Yes	71.7	71.3	69.5	68.6	67.5	Yes	No
R 1.21		69.6	70.0	70.0	Yes	65.4	64.9	63.8	63.3	62.9	Yes	Yes

Notes:
1) $L_{eq}(h)$ are A-weighted, peak-hour noise levels in decibels.
2) '-- indicates a barrier was not evaluated for these receivers.
3) * - Per the Highway Design Manual, the maximum height of a noise barrier should not exceed 14 feet when located 15 feet or less from edge of travel way.

Source: Noise Abatement Decision Report, January 2017.

Table 2.2.7-11. Noise Levels for Existing, No Build, and Build Alternative 3 – Segment 2

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)					Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	Feasible	Reasonable
R 2.1	--	60.1	60.7	60.2	No	--	--	--	--	--	--	--
R 2.2		66.7	67.1	63.8	No	--	--	--	--	--	--	--
R 2.3.2		56.0	56.5	57.5	No	--	--	--	--	--	--	--
R 2.3.3		60.3	60.7	61.7	No	--	--	--	--	--	--	--
R 2.4.1		55.6	56.0	57.0	No	--	--	--	--	--	--	--
R 2.4.2		56.2	56.6	57.5	No	--	--	--	--	--	--	--
R 2.4.3		58.1	58.5	59.5	No	--	--	--	--	--	--	--
R 2.5		55.0	55.3	56.5	No	--	--	--	--	--	--	--
R 2.6.2		56.7	57.1	58.2	No	--	--	--	--	--	--	--
R 2.6.3		59.9	60.2	61.4	No	--	--	--	--	--	--	--
R 2.7		76.0	76.8	77.9	No	--	--	--	--	--	--	--
R 2.8		74.1	74.2	75.2	No	--	--	--	--	--	--	--

Notes:
1) $L_{eq}(h)$ are A-weighted, peak-hour noise levels in decibels.
2) '-- indicates a barrier was not evaluated for these receivers.

Source: Noise Abatement Decision Report, January 2017.

Table 2.2.7-12. Noise Levels for Existing, No Build, and Build Alternative 3 – Segment 3

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)					Noise Abatement	
						14-foot Wall	16-foot Wall	18-foot Wall	20-foot Wall	22-foot Wall	Feasible	Reasonable
R3.1	--	58.9	59.0	60.4	No	--	--	--	--	--	--	--
R3.2		62.7	62.9	64.2	No	--	--	--	--	--	--	--
R3.3		62.3	62.5	63.7	No	--	--	--	--	--	--	--
R3.4		63.4	63.5	64.7	No	--	--	--	--	--	--	--
R3.5		64.5	64.7	65.9	No	--	--	--	--	--	--	--
R3.6		64.5	64.7	65.9	No	--	--	--	--	--	--	--
R3.7	Private Property	65.2	65.3	66.5	Yes	63	62	61	60.6	60	Yes	No
R3.8	--	64.3	64.4	65.7	No	--	--	--	--	--	--	--
R3.9		63.8	63.9	65.1	No	--	--	--	--	--	--	--
R 3.10	S228 / Private Property	61.2	61.3	62.6	No	--	--	61.8	61.5	61.1	No	No
R 3.11.2		69.6	69.7	71.0	Yes	--	--	69.1	64.9	63	Yes	Yes
R 3.12.2		69.9	70.0	71.3	Yes	--	--	69.4	64.7	63	Yes	Yes
R 3.13		61.4	61.5	62.9	No	--	--	61.6	60.1	58.9	No	No
R 3.14.1	--	58.5	58.6	59.9	No	--	--	--	--	--	--	--
R 3.14.2		59.8	59.9	61.0	No	--	--	--	--	--	--	--
R 3.14.3		63.8	63.9	65.0	No	--	--	--	--	--	--	--
R 3.15		57.8	57.9	59.4	No	--	--	--	--	--	--	--
R 3.16		52.1	52.1	54.0	No	--	--	--	--	--	--	--
R 3.17		74.0	75.6	76.0	No	--	--	--	--	--	--	--
R 3.18		73.0	73.7	74.8	No	--	--	--	--	--	--	--

Notes:
1) $L_{eq}(h)$ are A-weighted, peak-hour noise levels in decibels.
2) '-- indicates a barrier was not evaluated for these receivers.

Source: Noise Abatement Decision Report, January 2017.

Table 2.2.7-13. Noise Levels for Existing, No Build, and Build Alternative 3 – Segment 4

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)								Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	18-foot Wall	20-foot Wall	22-foot Wall	Feasible	Reasonable
R4.1	S255 / RW	67.0	67.2	69.1	Yes	68.5	65.7	64.4	63.4	62.7	62.2	61.7	61.4	Yes	Yes
R4.2		70.8	70.9	72.5	Yes	71.4	68.5	66.9	65.9	65.2	64.6	64.1	63.6	Yes	Yes
R4.3	SW271[X] / RW	67.8	67.9	69.1	Yes	--	--	--	--	67.4	66.3	65.4	64.6	No	No
R4.4		68.5	69.0	70.0	Yes	--	--	69.6	69.2	67.4	66.1	65.2	64.4	Yes	No
R4.5		67.1	67.8	68.4	Yes	--	--	67.6	66.7	65.9	65.0	64.4	63.7	No	No
R4.6		65.9	66.5	67.3	Yes	--	--	66.8	65.9	65.2	64.5	63.8	63.3	No	No
R4.7		66.1	66.9	67.4	Yes	--	--	66.9	66.3	65.7	65.2	64.7	64.4	No	No
R4.8		62.3	62.8	62.7	No	--	--	62.4	62.1	61.9	61.7	61.4	61.3	No	No
R4.9	SW311[X]/ RW	60.5	61.0	61.4	No	--	--	61.2	60.8	60.6	60.3	60.1	59.9	No	No
R4.10		62.3	63.3	64.0	No	--	--	63.4	62.6	61.9	61.2	60.6	60.2	No	No
R4.11		64.0	64.6	65.6	No	--	--	65.0	64.2	63.4	62.7	62.0	61.4	No	No
R4.12		65.4	66.1	66.9	Yes	--	--	66.0	64.9	63.9	63.0	62.2	61.5	Yes	No
R4.13		65.2	65.9	66.7	Yes	--	--	66.0	65.0	64.0	63.2	62.4	61.6	Yes	No
R4.14		65.7	66.1	67.1	Yes	--	--	66.3	65.2	64.3	63.5	62.7	62.0	Yes	No
R4.15		64.6	65.3	66.3	Yes	--	--	65.6	64.5	63.5	62.7	61.9	61.3	Yes	No
R4.16		65.6	66.3	67.1	Yes	--	--	66.4	65.3	64.3	63.4	62.6	61.9	Yes	No
R4.17		67.1	67.7	68.5	Yes	--	--	67.9	66.9	66.1	65.4	64.6	64.1	No	No
R4.18		67.2	67.7	68.5	Yes	--	--	67.7	66.7	65.8	65.0	64.2	63.6	No	No
R4.19		65.2	65.8	66.7	Yes	--	--	66.1	65.3	64.5	63.9	63.2	62.7	No	No
R4.20		65.6	66.2	67.2	Yes	--	--	66.6	65.7	65.1	64.3	63.7	63.1	No	No
R4.21		66.6	67.2	68.1	Yes	--	--	67.4	66.5	65.6	64.9	64.1	63.6	No	No
R4.22		65.8	66.4	67.5	Yes	--	--	66.6	65.7	64.7	64.0	63.3	62.7	No	No
R4.23		65.6	66.2	67.3	Yes	--	--	66.6	65.7	64.8	64.1	63.6	63.0	No	No
R4.24	--	62.5	63.2	64.1	No	--	--	--	--	--	--	--	--	--	--
R4.25		62.5	63.2	64.2	No	--	--	--	--	--	--	--	--	--	--
R4.9	SW311[X]/ RW	60.5	61.0	61.4	No	--	--	61.2	60.8	60.6	60.3	60.1	59.9	No	No
R4.10		62.3	63.3	64.0	No	--	--	63.4	62.6	61.9	61.2	60.6	60.2	No	No
R4.11		64.0	64.6	65.6	No	--	--	65.0	64.2	63.4	62.7	62.0	61.4	No	No
R4.12		65.4	66.1	66.9	Yes	--	--	66.0	64.9	63.9	63.0	62.2	61.5	Yes	No
R4.13		65.2	65.9	66.7	Yes	--	--	66.0	65.0	64.0	63.2	62.4	61.6	Yes	No

Table 2.2.7-13. Noise Levels for Existing, No Build, and Build Alternative 3 – Segment 4

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)								Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	18-foot Wall	20-foot Wall	22-foot Wall	Feasible	Reasonable
R4.14		65.7	66.1	67.1	Yes	--	--	66.3	65.2	64.3	63.5	62.7	62.0	Yes	No
R4.15		64.6	65.3	66.3	Yes	--	--	65.6	64.5	63.5	62.7	61.9	61.3	Yes	No
R4.16		65.6	66.3	67.1	Yes	--	--	66.4	65.3	64.3	63.4	62.6	61.9	Yes	No
R4.17		67.1	67.7	68.5	Yes	--	--	67.9	66.9	66.1	65.4	64.6	64.1	No	No
R4.18		67.2	67.7	68.5	Yes	--	--	67.7	66.7	65.8	65.0	64.2	63.6	No	No
R4.19		65.2	65.8	66.7	Yes	--	--	66.1	65.3	64.5	63.9	63.2	62.7	No	No
R4.20		65.6	66.2	67.2	Yes	--	--	66.6	65.7	65.1	64.3	63.7	63.1	No	No
R4.21		66.6	67.2	68.1	Yes	--	--	67.4	66.5	65.6	64.9	64.1	63.6	No	No
R4.22		65.8	66.4	67.5	Yes	--	--	66.6	65.7	64.7	64.0	63.3	62.7	No	No
R4.23		65.6	66.2	67.3	Yes	--	--	66.6	65.7	64.8	64.1	63.6	63.0	No	No
R4.24	--	62.5	63.2	64.1	No	--	--	--	--	--	--	--	--	--	--
R4.25		62.5	63.2	64.2	No	--	--	--	--	--	--	--	--	--	--
R4.26	Private Property	62.8	62.8	63.7	No	63.5	63.4	63.5	63.4	63.3	63.3	63.2	63.2	No	No
R4.27		62.7	62.7	64.2	No	62.8	62.4	62.7	62.0	61.9	61.7	61.6	61.5	No	No
R4.28		61.2	61.2	62.7	No	61.8	61.5	61.3	60.7	60.4	60.0	59.8	59.5	No	No
R4.29.1		58.6	58.6	60.2	No	60.1	59.6	59.1	58.6	58.1	57.6	57.0	56.5	No	No
R4.29.2		65.1	65.0	66.9	Yes	64.5	62.9	61.7	60.8	60.0	59.2	58.4	57.8	Yes	Yes
R4.30.1		64.0	64.1	65.7	No	65.1	64.6	63.9	63.3	62.9	62.4	61.9	61.3	No	No
R4.30.2		73.4	73.3	75.1	Yes	71.7	69.1	67.4	66.1	65.1	64.2	63.3	62.6	Yes	Yes
R4.31.1		63.6	63.7	65.1	No	64.4	63.8	63.2	62.8	62.3	61.9	61.5	61.0	No	No
R4.31.2		69.7	69.8	71.4	Yes	69.0	67.4	65.9	65.1	64.2	63.4	62.5	61.8	Yes	Yes
R4.32.1		63.2	63.3	64.7	No	64.0	63.4	62.8	62.4	61.9	61.4	61.0	60.6	No	No
R4.32.2		67.9	68.0	69.5	Yes	67.8	66.4	65.2	64.5	63.4	62.6	62.0	61.2	Yes	Yes
R 4.33		64.0	64.2	65.5	No	64.8	64.0	63.3	62.9	62.4	61.9	61.5	60.9	No	No
R 4.34.1		62.6	62.9	64.2	No	63.6	63.1	62.5	62.1	61.7	61.3	61.0	60.7	No	No
R 4.34.2		68.7	68.8	70.3	Yes	68.1	66.9	66.0	65.3	64.1	63.4	62.7	62.1	Yes	Yes
R 4.35.1	S266 / Private Property	66.6	67.0	68.4	Yes	64.9	62.9	60.4	59.1	57.8	56.8	56.4	56.0	Yes	Yes
R 4.35.2		67.4	67.5	69.0	Yes	69.0	69.0	69.0	69.0	68.8	68.7	68.3	68.1	No	No
R 4.36	Private Property	69.1	69.5	70.8	Yes	67.8	66.1	65.3	64.2	63.2	62.4	61.7	61.2	Yes	Yes
R 4.37	--	63.3	63.9	65.0	No	--	--	--	--	--	--	--	--	--	--

Table 2.2.7-13. Noise Levels for Existing, No Build, and Build Alternative 3 – Segment 4

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)								Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	18-foot Wall	20-foot Wall	22-foot Wall	Feasible	Reasonable
R 4.38		63.1	63.5	64.6	No	--	--	--	--	--	--	--	--	--	--
R 4.39	Private Property	62.7	63.1	64.4	No	--	--	--	--	--	--	--	--	--	--
R 4.40		65.1	65.6	66.8	Yes	65.7	64.7	63.8	63.1	62.4	61.8	61.2	60.7	Yes	No
R 4.41		63.2	63.6	64.9	No	64.3	63.6	62.9	62.4	61.8	61.3	60.8	60.5	No	No
R 4.42		61.6	61.9	63.3	No	62.7	62.0	61.3	60.7	60.1	59.5	59.0	58.6	No	No
R 4.43		61.7	62.2	63.6	No	63.3	62.7	62.1	61.5	60.9	60.4	60.0	59.6	No	No
R 4.44	--	61.7	62.2	63.5	No	--	--	--	--	--	--	--	--	--	--
R 4.45		63.4	63.8	65.1	No	--	--	--	--	--	--	--	--	--	--
R 4.46	S322 / RW (Option 1)	63.2	63.6	64.9	No	62.3	61.5	61.0	60.7	60.5	60.6	60.7	60.8	No	No
R 4.47		62.8	63.2	64.5	No	62.0	60.9	60.2	59.4	59.4	59.2	59.0	58.9	Yes	No
R 4.48		65.0	65.4	66.5	Yes	63.8	62.2	61.0	60.2	59.6	59.1	58.6	58.3	Yes	Yes
R 4.49		64.2	64.6	65.6	No	63.1	61.6	60.4	59.6	59.2	59.6	59.5	59.8	Yes	No
R4.50.1		65.0	65.5	66.6	Yes	64.9	63.1	61.9	60.9	60.1	59.8	59.6	59.7	Yes	No
R4.50.2		73.7	74.3	75.2	Yes	74	72.1	70.8	69.2	67.5	66.7	65.8	65.0	Yes	Yes
R4.51		64.7	65.3	66.5	Yes	65.5	64.2	61.8	62.0	61.6	61.5	61.3	61.0	Yes	No
R4.52		62.0	62.5	64.0	No	63.1	62.2	61.7	61.9	62.3	62.2	62.0	62.0	No	No
R4.53		58.8	59.2	60.4	No	60.1	60.0	59.9	59.9	59.9	59.9	60.0	59.9	No	No
R 4.48	S322 / Private Property (Option 2)	65.0	65.4	66.5	Yes	65.3	64.4	63.7	62.9	62.3	61.7	61.4	60.7	Yes	No
R 4.49	--	64.2	64.6	65.6	No	64.8	64.0	63.3	62.7	62.1	61.6	61.2	60.7	No	No
R4.50.1	--	65.0	65.5	66.6	Yes	65.8	65.1	64.5	64.0	63.5	63.1	62.7	62.3	No	No
R4.50.2	--	73.7	74.3	75.2	Yes	71.8	70.1	68.9	68	67.1	66.3	65.9	65.4	Yes	Yes

Notes:
1) $L_{eq}(h)$ are A-weighted, peak-hour noise levels in decibels.
2) '-- indicates a barrier was not evaluated for these receivers.
3) X = existing soundwall
4) * - Per the Highway Design Manual, the maximum height of a noise barrier should not exceed 14 feet when located 15 feet or less from edge of travel way.

Source: Noise Abatement Decision Report, January 2017.

Table 2.2.7-14. Noise Levels for Existing, No Build, and Build Alternative 3 – Segment 5

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)								Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	18-foot Wall	20-foot Wall	22-foot Wall	Feasible	Reasonable
R5.1	SW57[X] / Private Property	60.7	60.9	61.9	No	--	--	--	--	--	--	--	--	--	--
R5.2	--	63.6	63.6	64.2	No	--	--	--	--	--	--	--	--	--	--
R5.3	SW91[X] / Private Property	65.8	65.8	66.1	Yes	--	--	--	--	--	65.5	65.0	64.5	No	No
R5.4.1	SW31[X] / RW	63.7	63.8	64.8	No	--	--	--	--	--	64.2	63.8	63.3	No	No
R5.4.2		65.8	65.8	66.6	Yes	--	--	--	--	--	65.8	65.0	64.3	No	No
R5.5.1		60.2	60.3	60.6	No	--	--	--	--	--	60.1	59.7	59.4	No	No
R5.5.2		62.3	62.4	62.6	No	--	--	--	--	--	62.3	61.7	61.3	No	No
R5.6	SW350[X] / RW	61.0	61.0	62.0	No	--	--	--	62.0	61.9	61.9	61.8	61.8	No	No
R5.7		61.1	61.1	62.6	No	--	--	--	62.6	62.0	61.6	61.3	61.1	No	No
R5.8		62.8	62.8	64.0	No	--	--	--	64.0	63.8	64.6	63.9	63.3	No	No
R5.9		66.8	66.7	67.7	Yes	--	--	--	67.7	66.7	66.0	65.3	64.6	No	No
R5.10		66.5	66.5	67.2	Yes	--	--	--	67.2	66.3	65.7	65.0	64.4	No	No
R5.11		65.0	65.2	66.3	Yes	--	--	--	66.2	66.8	65.4	64.5	63.8	No	No
R5.12		67.7	67.7	68.0	Yes	68.0	68.0	68.0	68.0	67.0	66.3	65.6	64.9	No	No
R5.13		66.3	66.4	67.6	Yes	67.5	67.5	67.4	67.3	66.3	66.6	65.1	64.3	No	No
R5.14		69.1	69.3	69.8	Yes	69.0	68.8	68.8	68.7	67.6	66.2	65.0	64.3	Yes	No
R5.15	RW	67.1	67.3	67.9	Yes	64.7	64.1	63.5	64.3	63.5	62.9	62.2	61.6	Yes	No
R5.15	RW	67.1	67.3	67.9	Yes	64.7	64.1	63.5	64.3	63.8	63.5	63.2	62.9	Yes	No
R5.16	--	65.3	65.4	65.7	No	--	--	--	--	--	--	--	--	--	--
R5.17		66	66.1	66.4	No	--	--	--	--	--	--	--	--	--	--
R5.18		76.0	76.0	75.7	No	--	--	--	--	--	--	--	--	--	--
R5.19.2		79.7	79.7	79.9	No	--	--	--	--	--	--	--	--	--	--
R5.20		53.4	53.8	53.4	No	--	--	--	--	--	--	--	--	--	--
R5.21		65.7	66.0	65.8	No	--	--	--	--	--	--	--	--	--	--
R5.15	RW	67.1	67.3	67.9	Yes	64.7	64.1	63.5	64.3	63.5	62.9	62.2	61.6	Yes	No
R5.15	RW	67.1	67.3	67.9	Yes	64.7	64.1	63.5	64.3	63.8	63.5	63.2	62.9	Yes	No
R5.16	--	65.3	65.4	65.7	No	--	--	--	--	--	--	--	--	--	--
R5.17		66	66.1	66.4	No	--	--	--	--	--	--	--	--	--	--

Table 2.2.7-14. Noise Levels for Existing, No Build, and Build Alternative 3 – Segment 5

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)								Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	18-foot Wall	20-foot Wall	22-foot Wall	Feasible	Reasonable
R5.18		76.0	76.0	75.7	No	--	--	--	--	--	--	--	--	--	--
R5.19.2		79.7	79.7	79.9	No	--	--	--	--	--	--	--	--	--	--
R5.20		53.4	53.8	53.4	No	--	--	--	--	--	--	--	--	--	--
R5.21		65.7	66.0	65.8	No	--	--	--	--	--	--	--	--	--	--

Notes:
1) $L_{eq}(h)$ are A-weighted, peak-hour noise levels in decibels.
2) '-- indicates a barrier was not evaluated for these receivers.
3) X = existing soundwall
4) * - Per the Highway Design Manual, the maximum height of a noise barrier should not exceed 14 feet when located 15 feet or less from edge of travel way.

Source: Noise Abatement Decision Report, January 2017.

Table 2.2.7-15. Noise Levels for Existing, No Build, and Build Alternative 3 – Segment 6

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)					Noise Abatement	
						14-foot Wall	16-foot Wall	18-foot Wall	20-foot Wall	22-foot Wall	Feasible	Reasonable
R 6.1.2	RW	70.1	70.2	70.5	No	70.4	67.5	64.2	62.3	60.9	Yes	Yes
R 6.1.4		73.0	73.1	73.4	No	73.4	73.4	73.4	73.4	73.4	No	No
R 6.2.2	S417 / RW	67.0	67.1	67.0	Yes	61.6	59.9	58.8	57.3	56.5	Yes	Yes
R 6.2.4		71.9	72.0	72.1	Yes	72.1	72.0	71.9	71.9	71.4	No	No
R 6.3.2		65.7	65.9	66.0	Yes	61.7	60.1	58.7	57.9	56.3	Yes	Yes
R 6.3.3		71.4	71.5	71.9	Yes	71.7	70.9	68.8	64.2	61.9	Yes	Yes
R 6.3.4		71.8	71.9	72.1	Yes	72.1	72.0	71.9	71.9	71.5	No	No
R 6.3.5		71.9	72.0	72.4	Yes	72.4	72.4	72.4	72.3	72.2	No	No
R 6.4.2		68.2	68.3	68.4	Yes	62.6	61.4	59.8	58.7	58.0	Yes	Yes
R 6.4.3		73.6	73.7	73.9	Yes	73	70.9	67.1	64.3	62.5	Yes	Yes
R 6.4.4		74.1	74.2	74.2	Yes	74.1	74.0	74.0	73.5	72.3	No	No
R 6.4.5		74.1	74.2	74.4	Yes	74.4	74.4	74.3	74.2	74.2	No	No
R 6.5.2		76.4	76.5	76.6	Yes	69.3	68.5	68.1	67.6	67.3	Yes	Yes
R 6.5.3		77.9	77.9	77.9	Yes	76.8	75.3	72.7	70.4	69.3	Yes	Yes
R 6.5.4		77.8	77.9	78.0	Yes	78	77.9	77.6	77.0	76.0	No	No
R 6.5.5		77.8	77.9	78.0	Yes	78	78.0	78.0	77.9	77.7	No	No
R6.6	--	68.5	68.7	68.6	No	--	--	--	--	--	--	--
R6.7		67.8	68.0	68.1	No	--	--	--	--	--	--	--
R6.8	--	72.9	73.1	73.1	Yes	67.1	66.1	65.2	64.5	64.0	Yes	Yes
R6.9		73.7	73.9	73.9	Yes	68.3	67.2	66.3	65.6	65.1	Yes	Yes
R6.10	--	68.9	69.0	68.4	No	--	--	--	--	--	--	--

Notes:
1) $L_{eq}(h)$ are A-weighted, peak-hour noise levels in decibels.
2) '-- indicates a barrier was not evaluated for these receivers.
3) RW = right-of-way
4) * - Per the Highway Design Manual, the maximum height of a noise barrier should not exceed 14 feet when located 15 feet or less from edge of travel way.

Source: Noise Abatement Decision Report, January 2017.

Table 2.2.7-16. Noise Levels for Existing, No Build, and Build Alternative 3 – Segment 7

Receptor #	Barrier ID and Location	Existing Noise Level (dBA)	Design Year No Build Noise Level $L_{eq}(h)$, dBA	Design Year Build Noise Level $L_{eq}(h)$, dBA	Noise Impact Requiring Abatement Consideration	Predicted Noise Level with Abatement (dBA)					Noise Abatement	
						8-foot Wall	10-foot Wall	12-foot Wall	14-foot Wall	16-foot Wall	Feasible	Reasonable
R7.1	--	70.9	71.2	71.0	Yes	65.3	63.9	62.4	61.0	60.3	Yes	Yes
R7.2	--	67.1	67.4	67.5	No	--	--	--	--	--	--	--
R7.3		66.2	66.4	66.5	No	--	--	--	--	--	--	--

1) $L_{eq}(h)$ are A-weighted, peak-hour noise levels in decibels.
2) '-- indicates a barrier was not evaluated for these receivers.

Source: Noise Abatement Decision Report, January 2017.

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Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 1 of 20)

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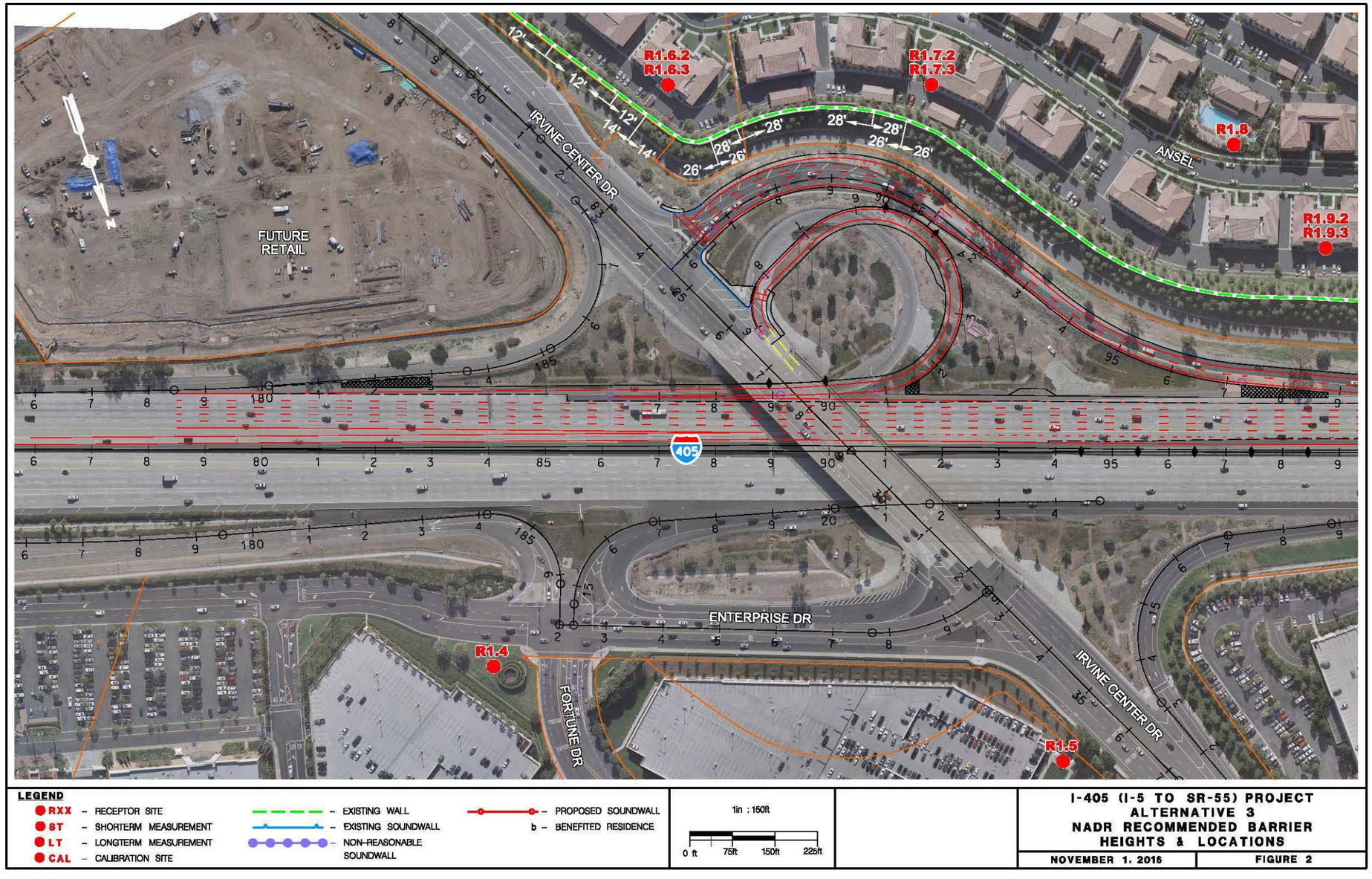

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 2 of 20)

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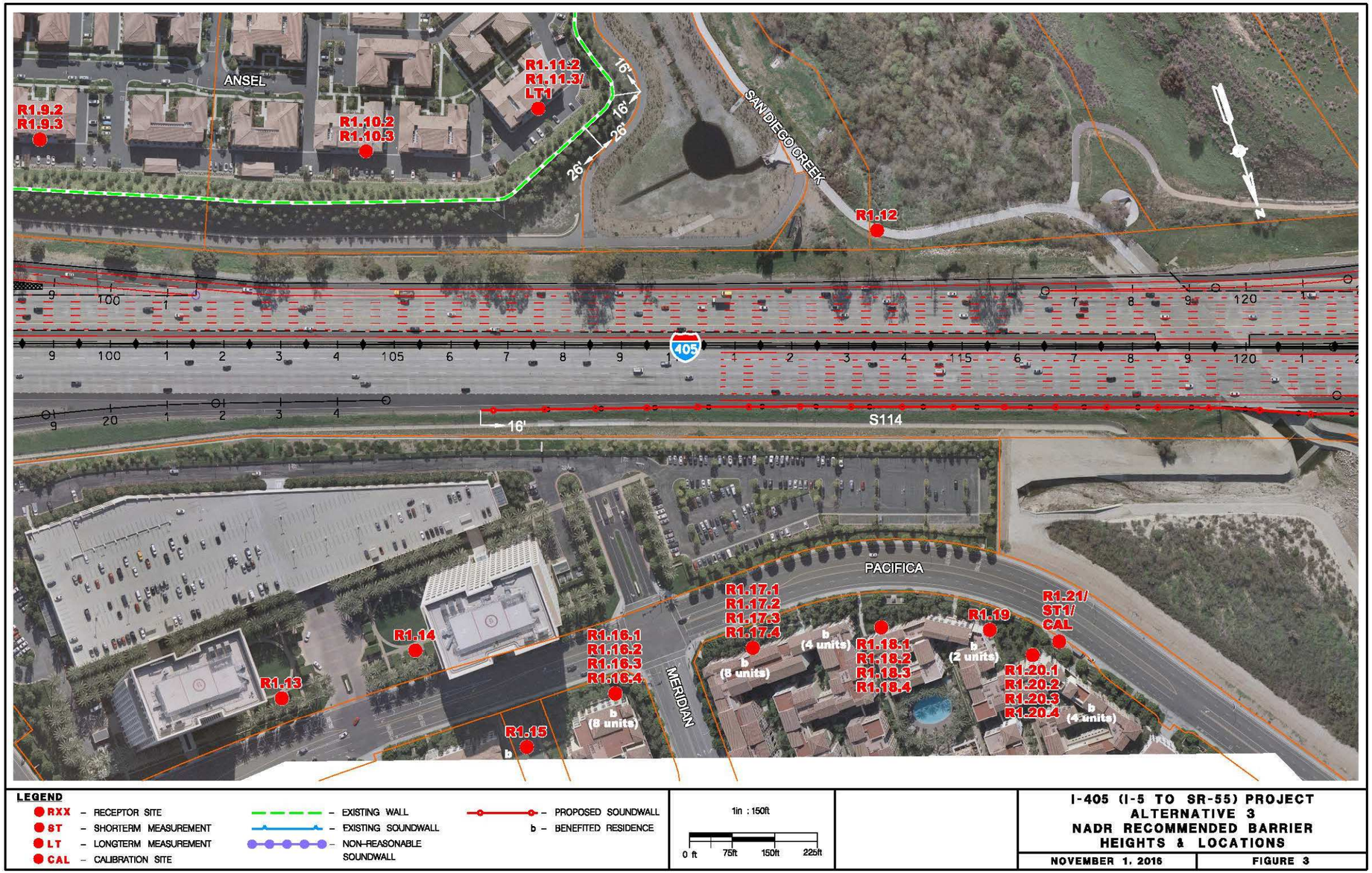

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 3 of 20)

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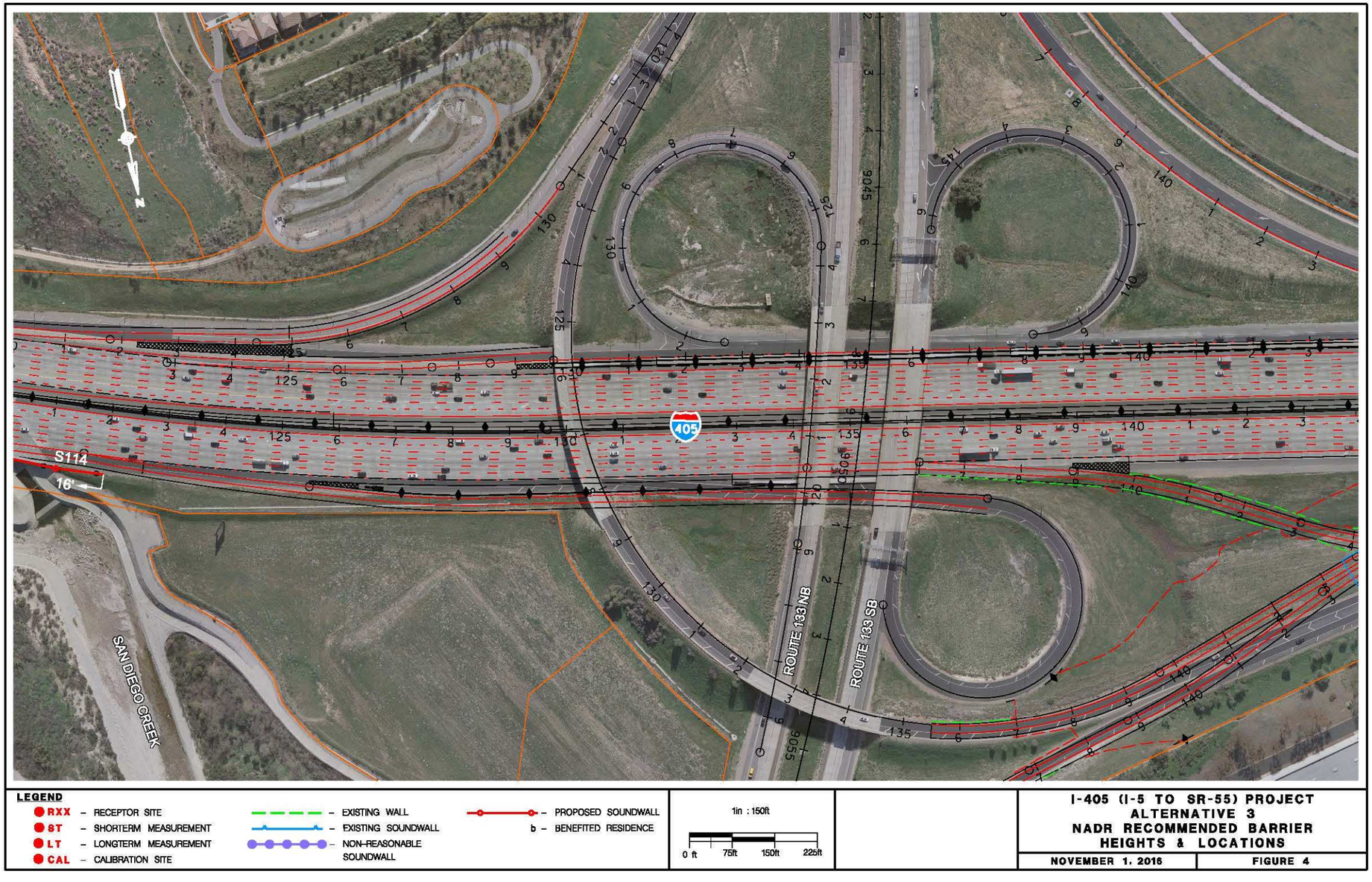

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 4 of 20)

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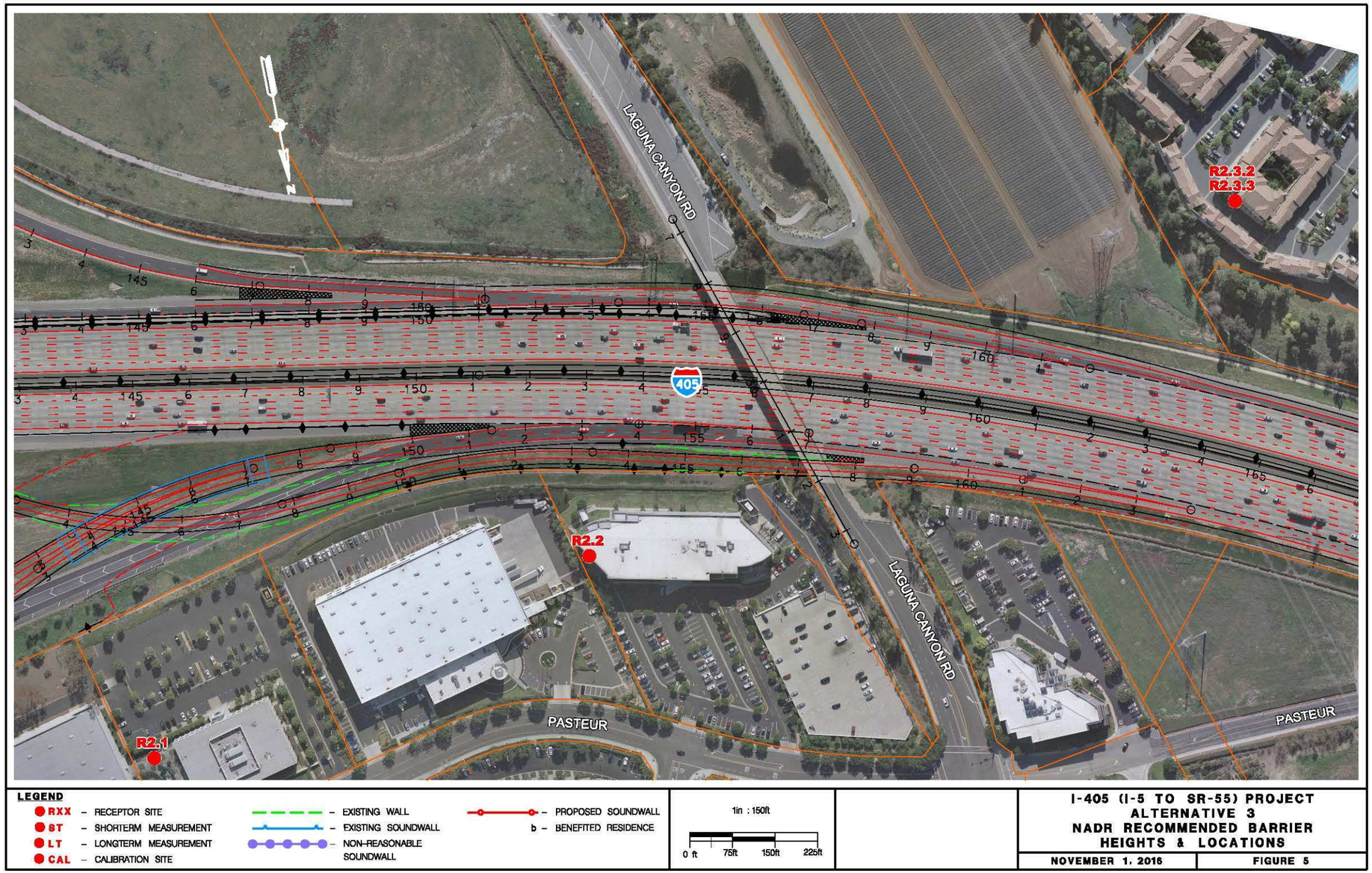

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 5 of 20)

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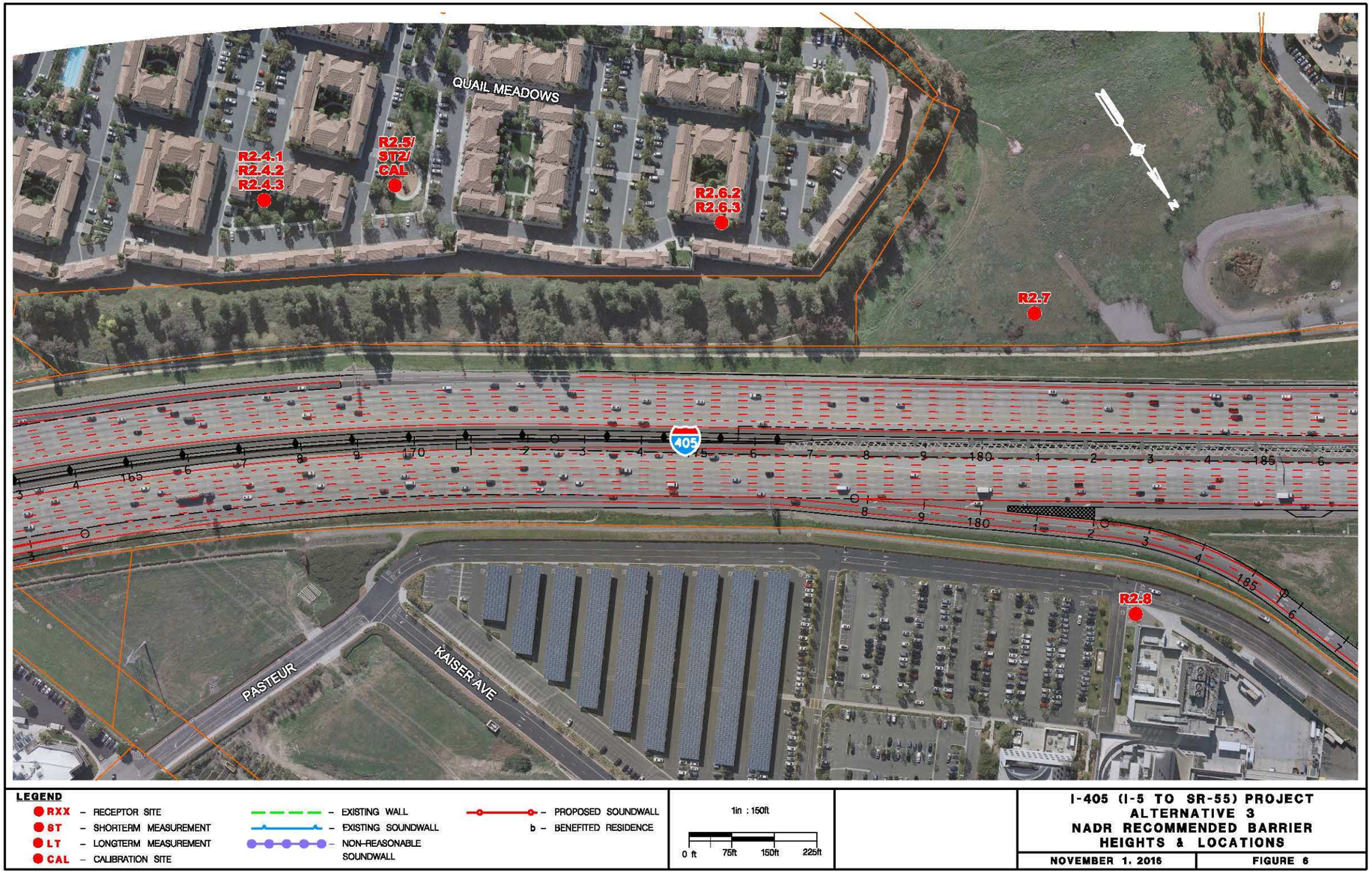

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 6 of 20)

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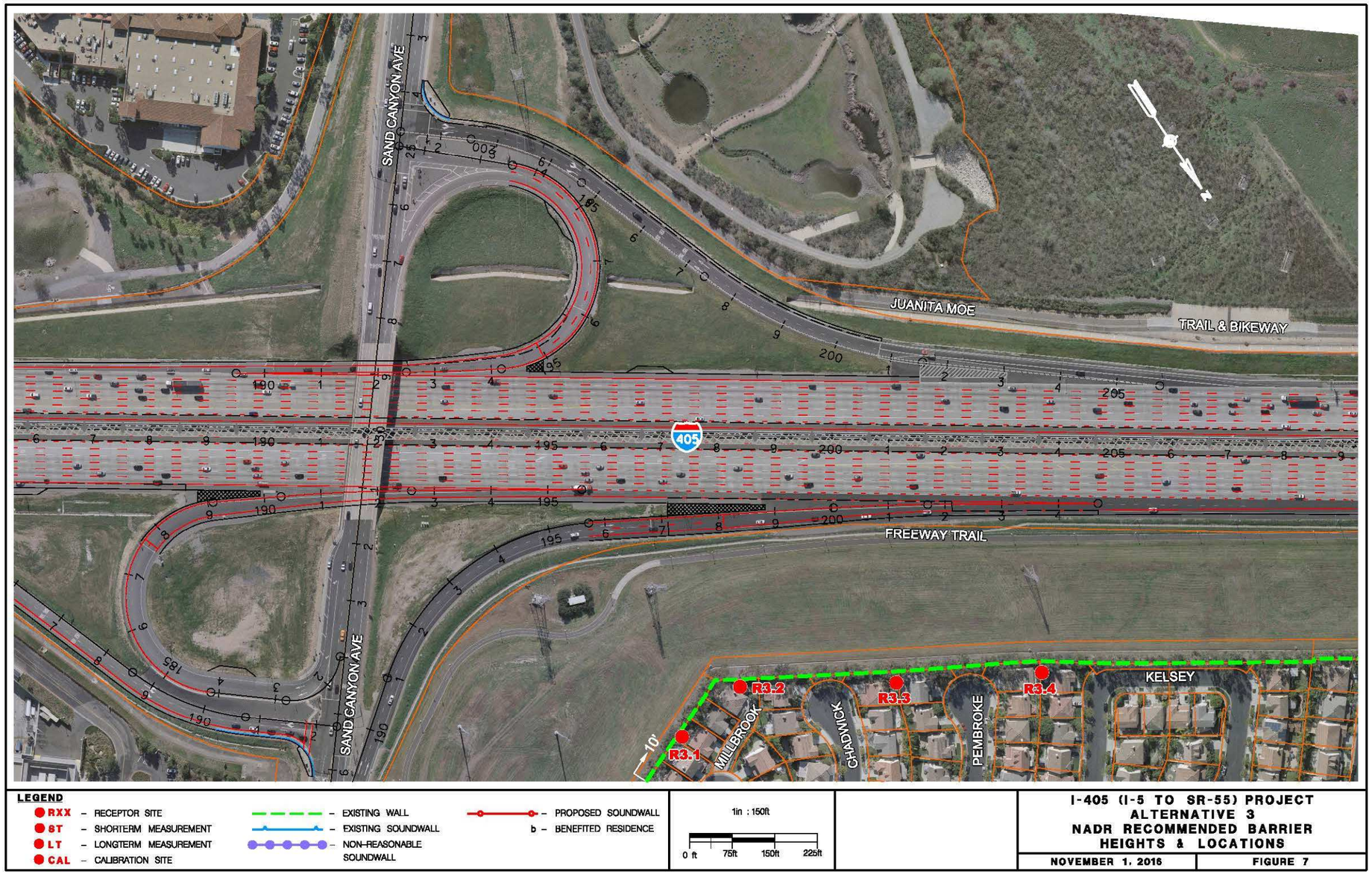

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 7 of 20)

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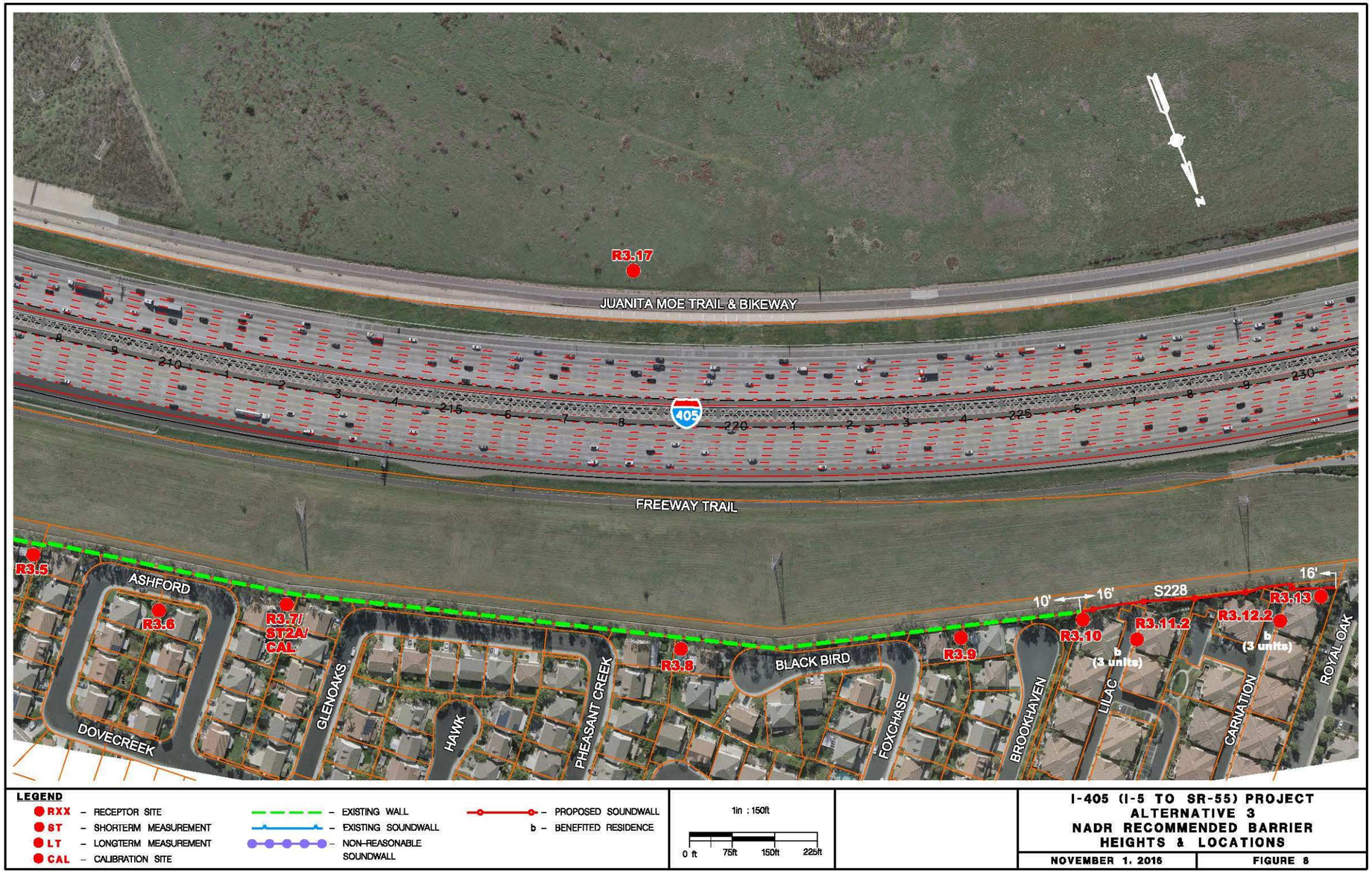

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 8 of 20)

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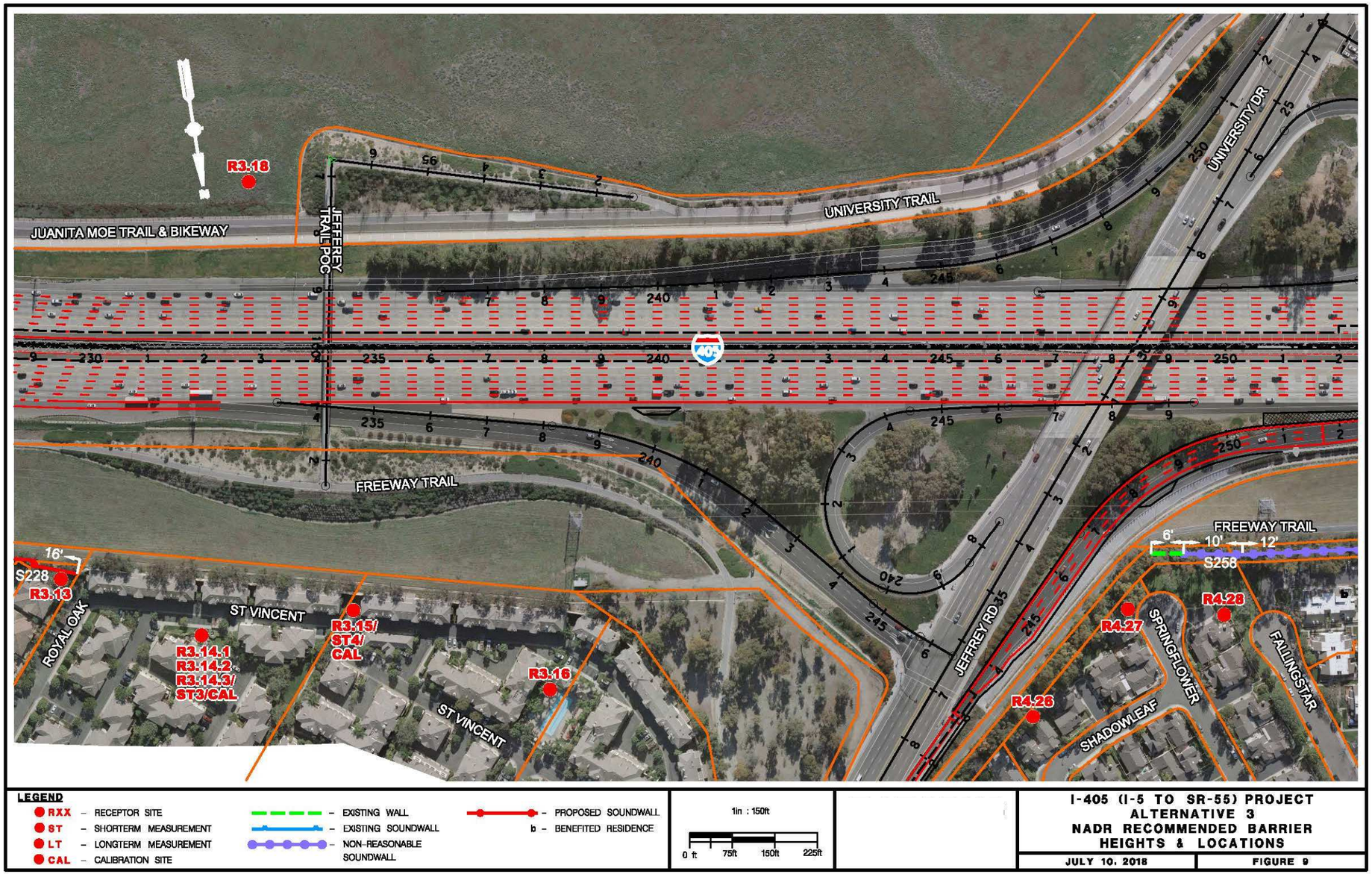

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 9 of 20)

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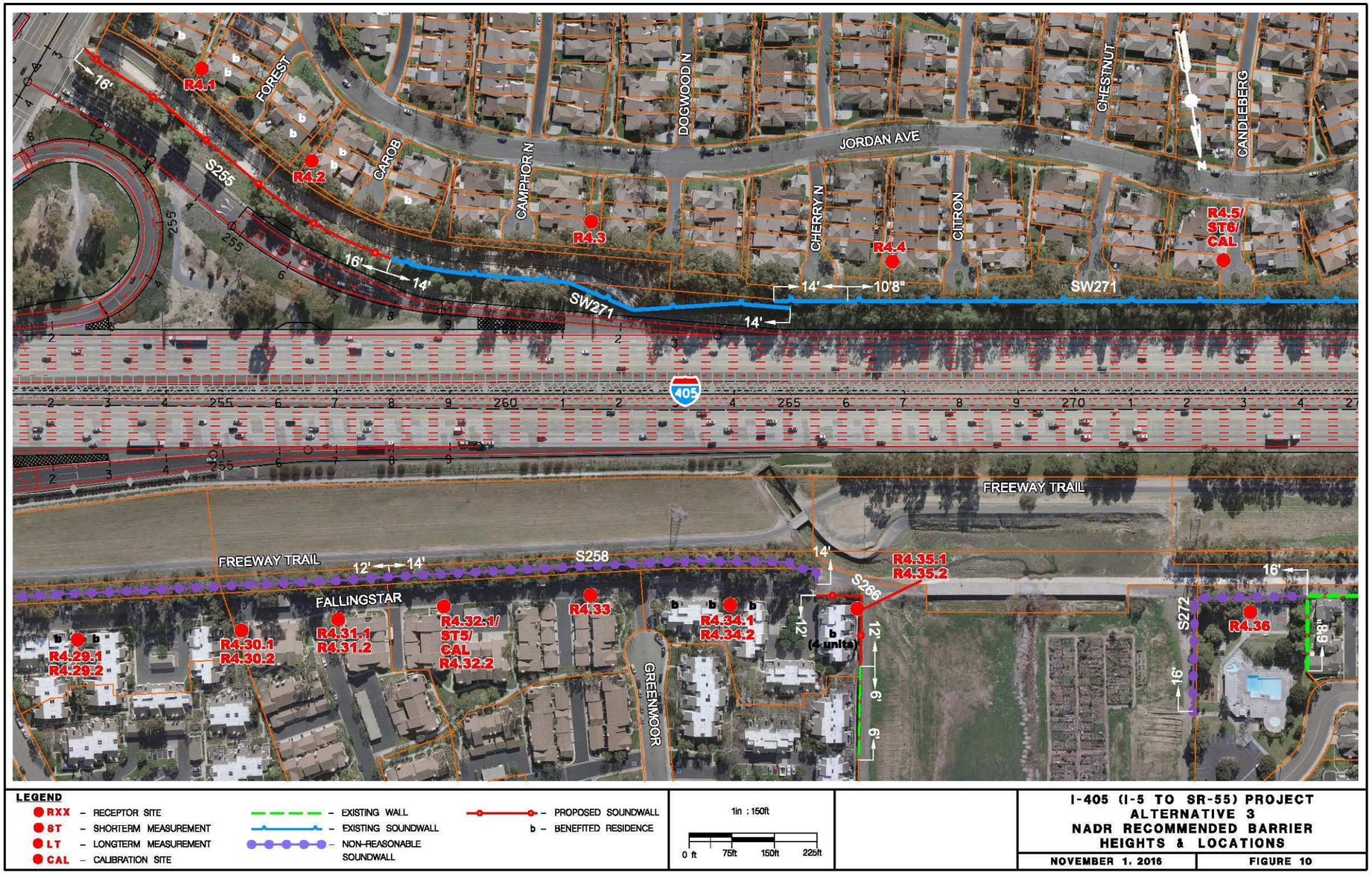

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 10 of 20)

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Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 11 of 20)

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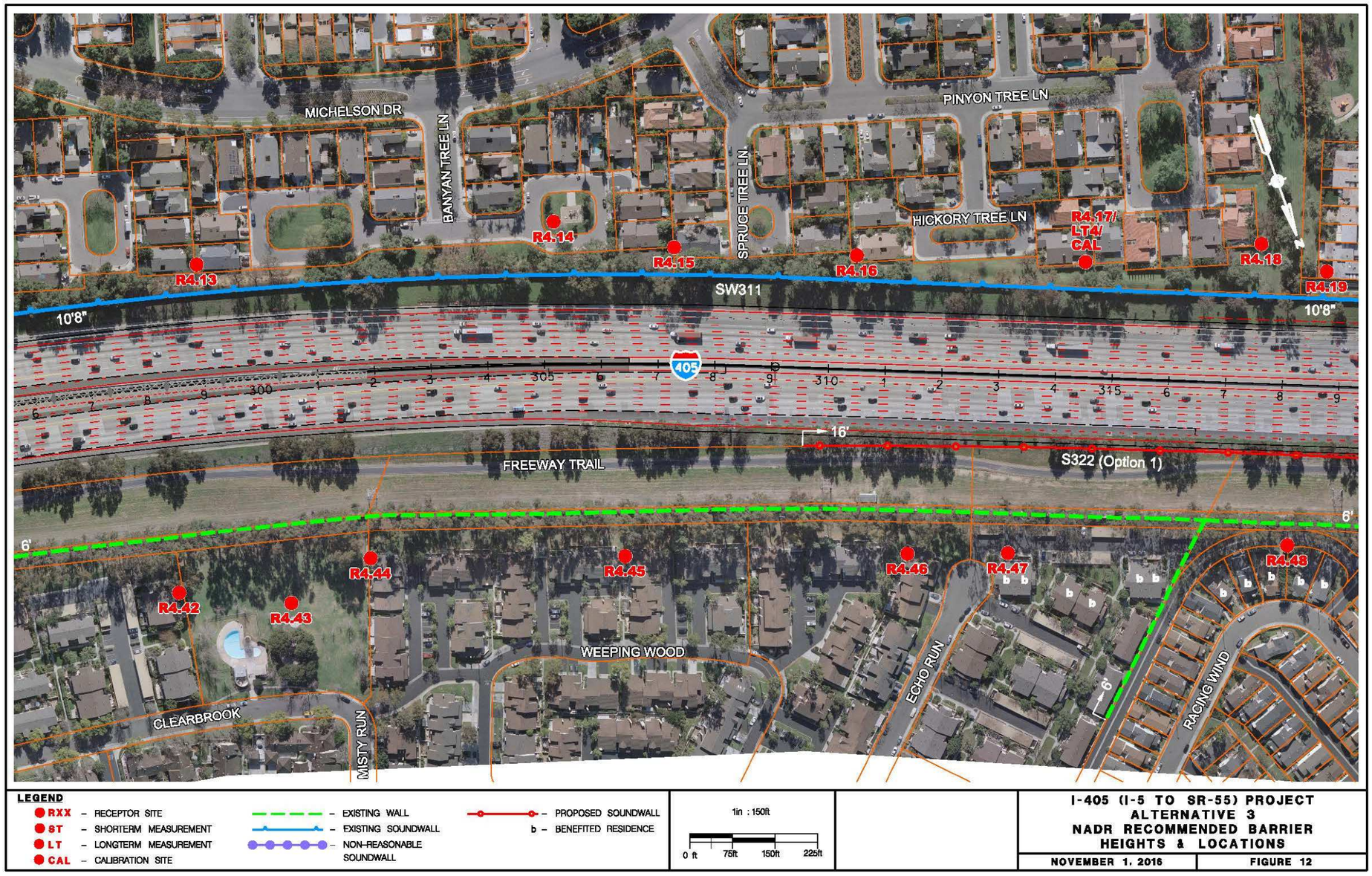

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 12 of 20)

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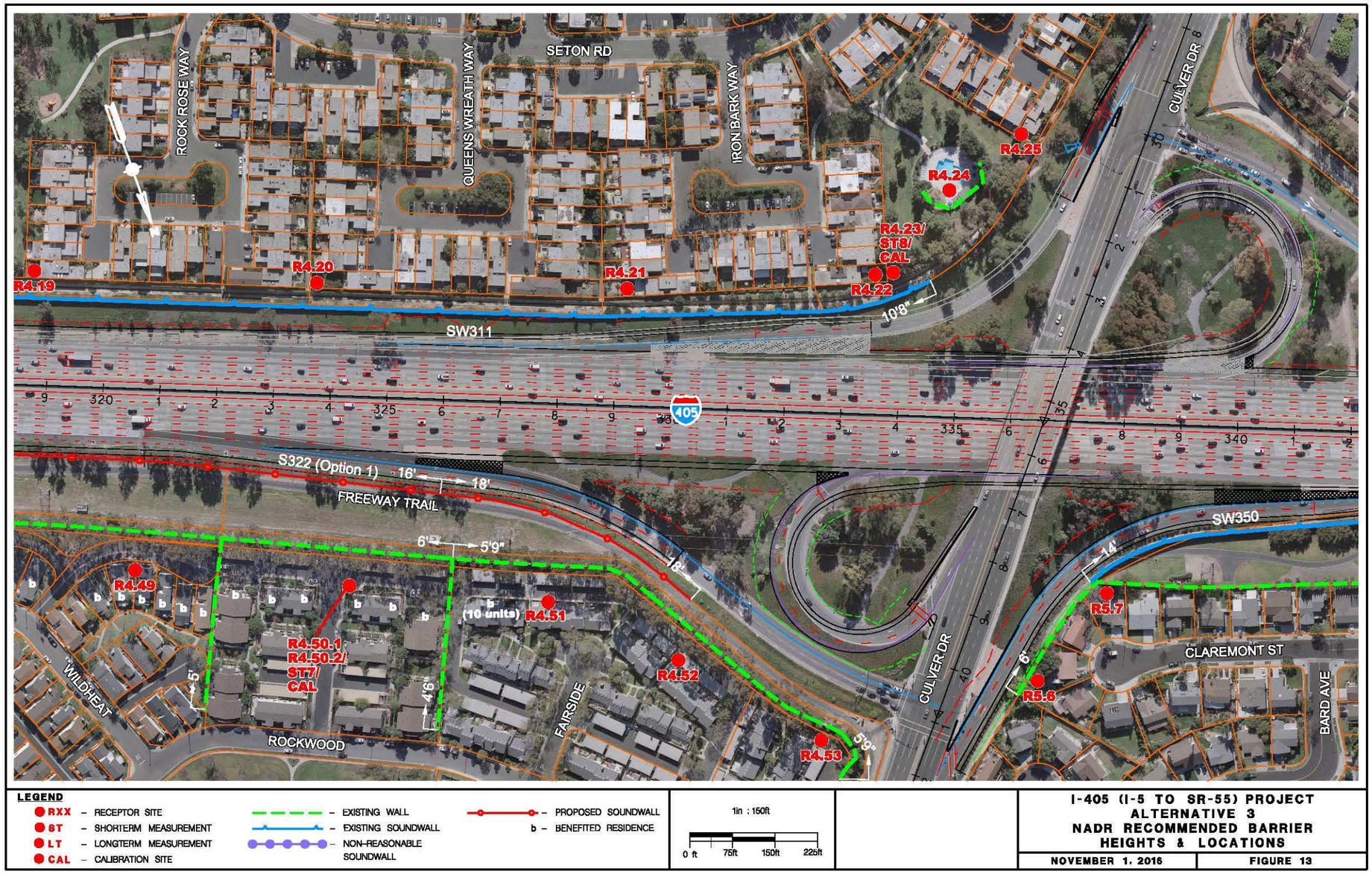

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 13 of 20)

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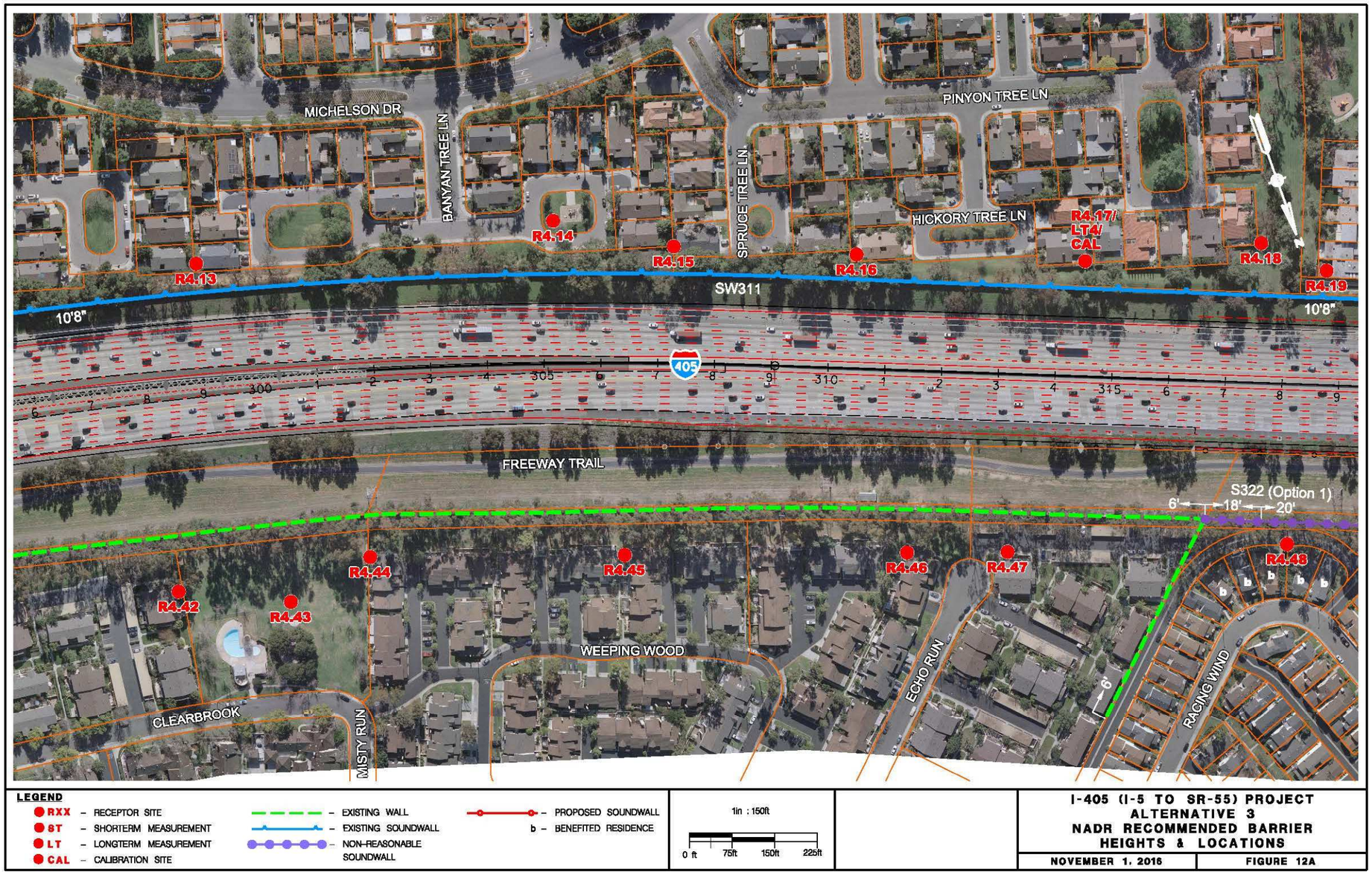

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 12A of 20)

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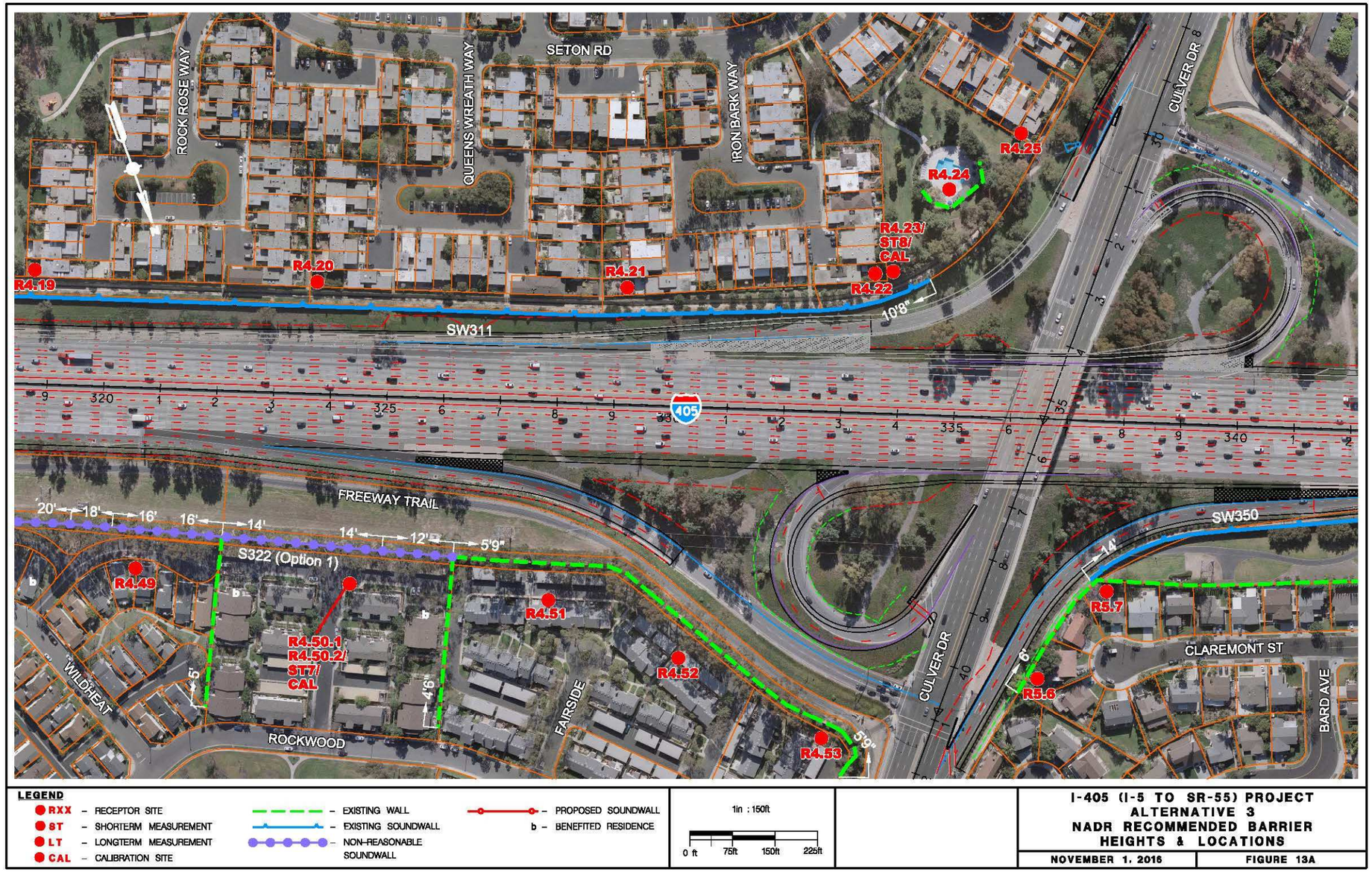

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 13A of 20)

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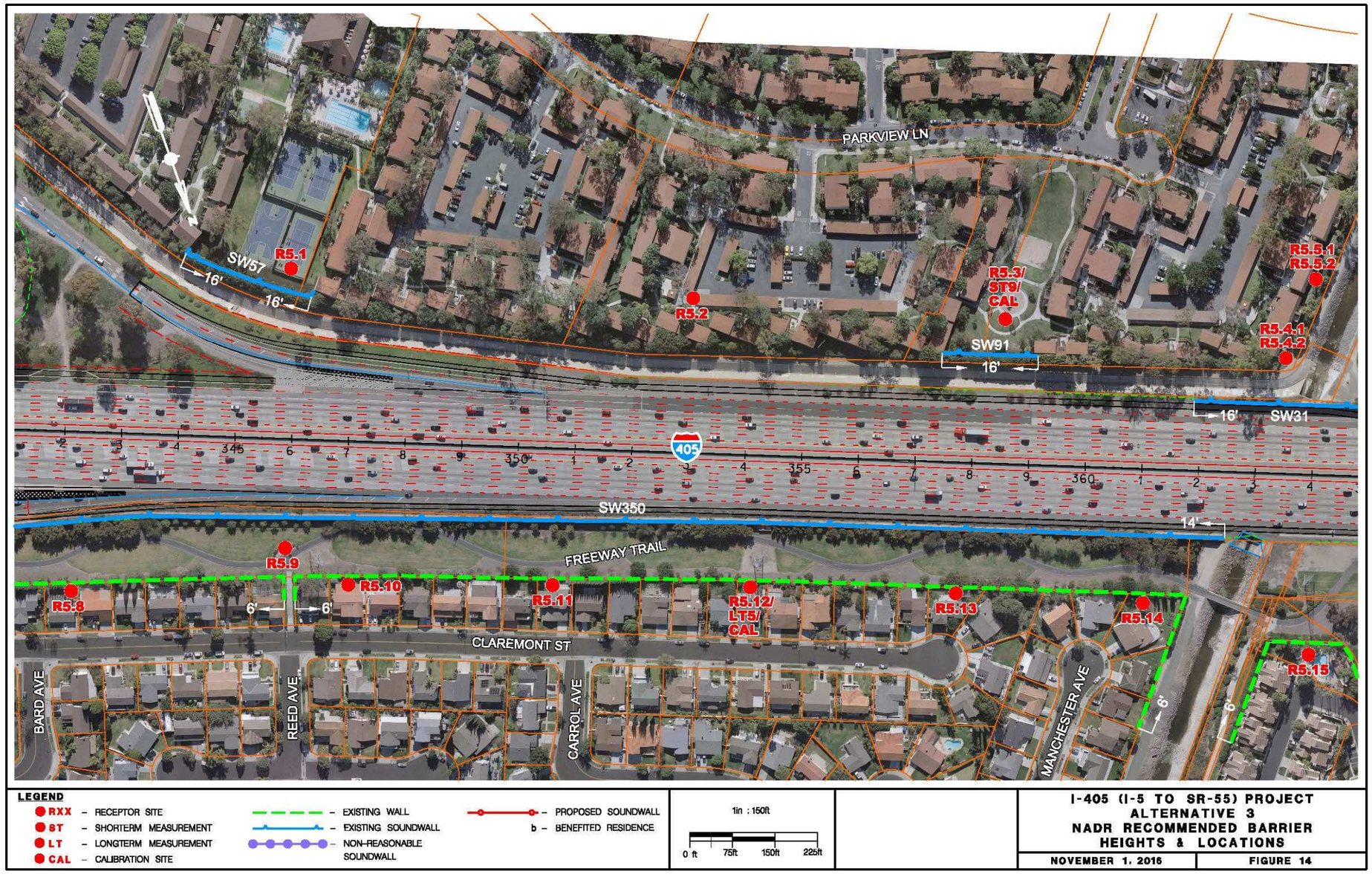

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 14 of 20)

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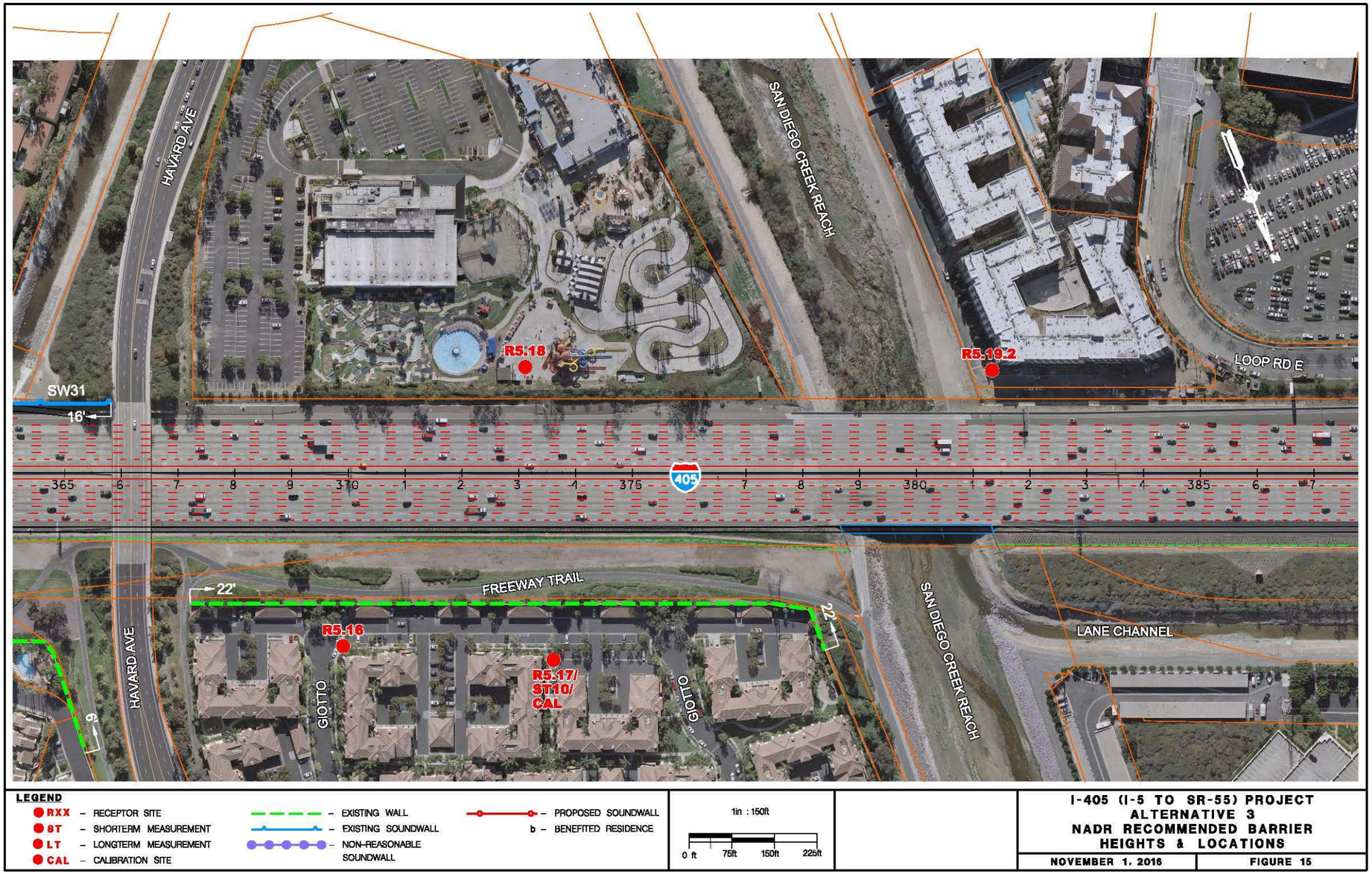

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 15 of 20)

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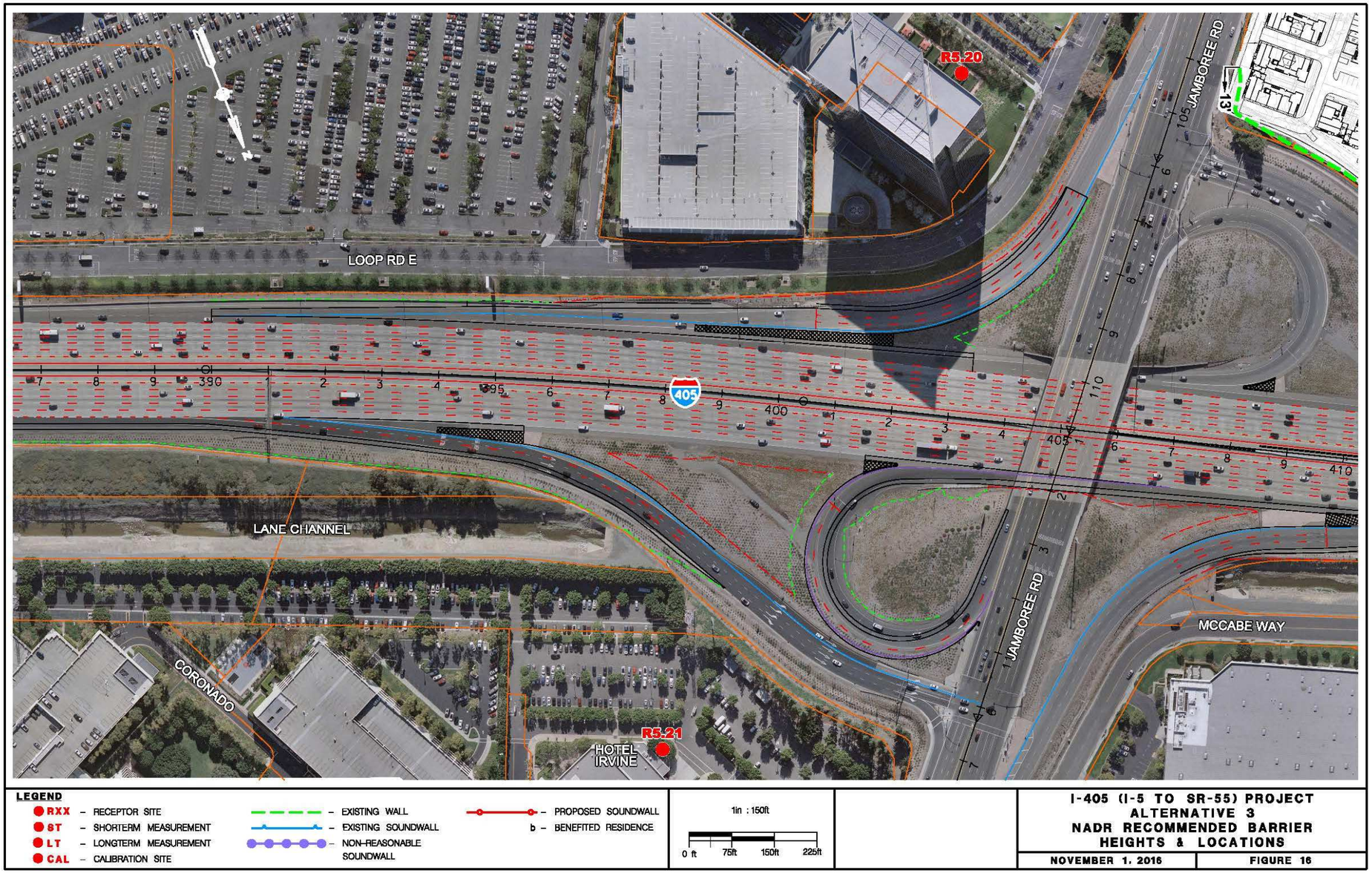

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 16 of 20)

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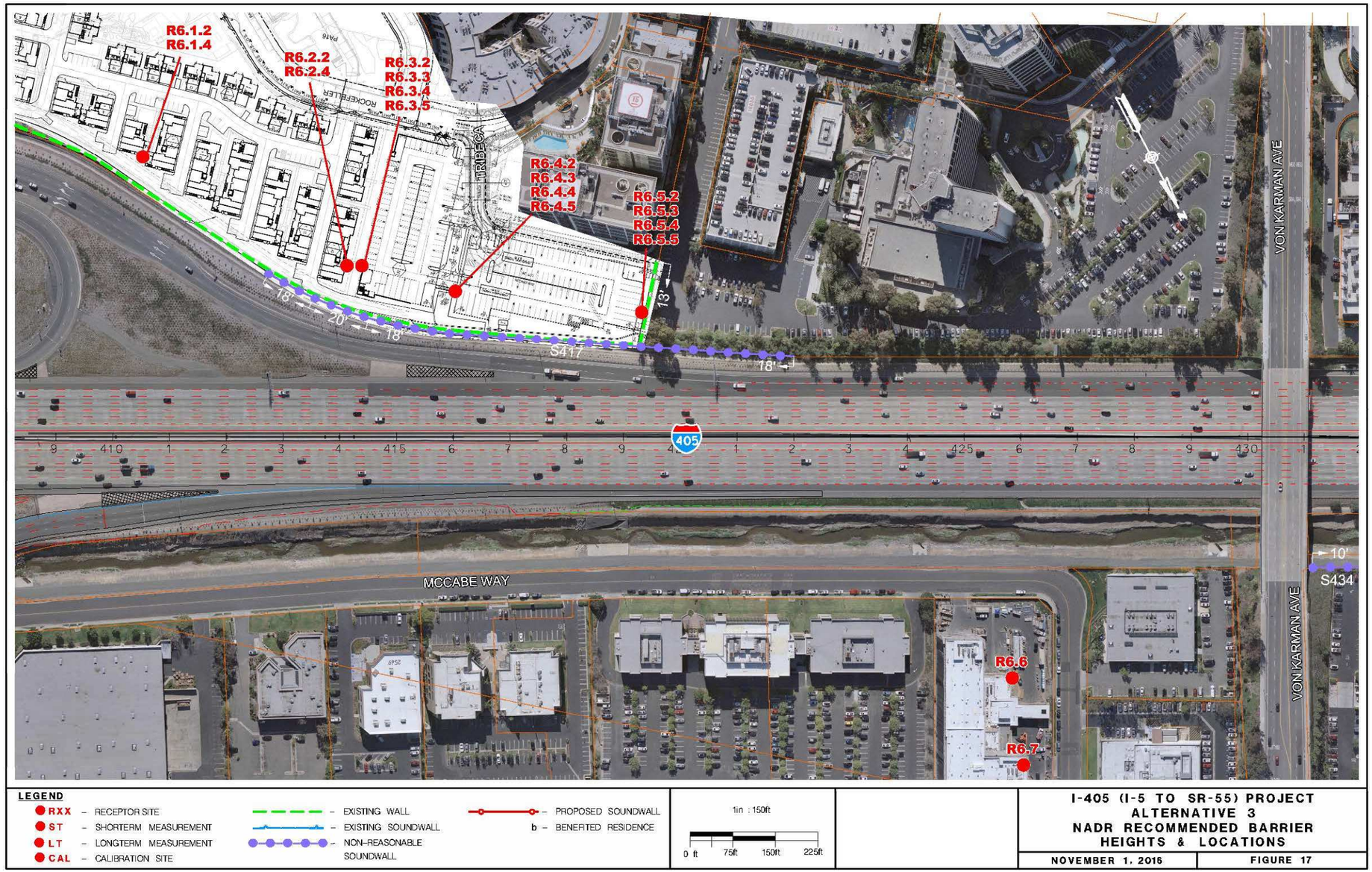

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 17 of 20)

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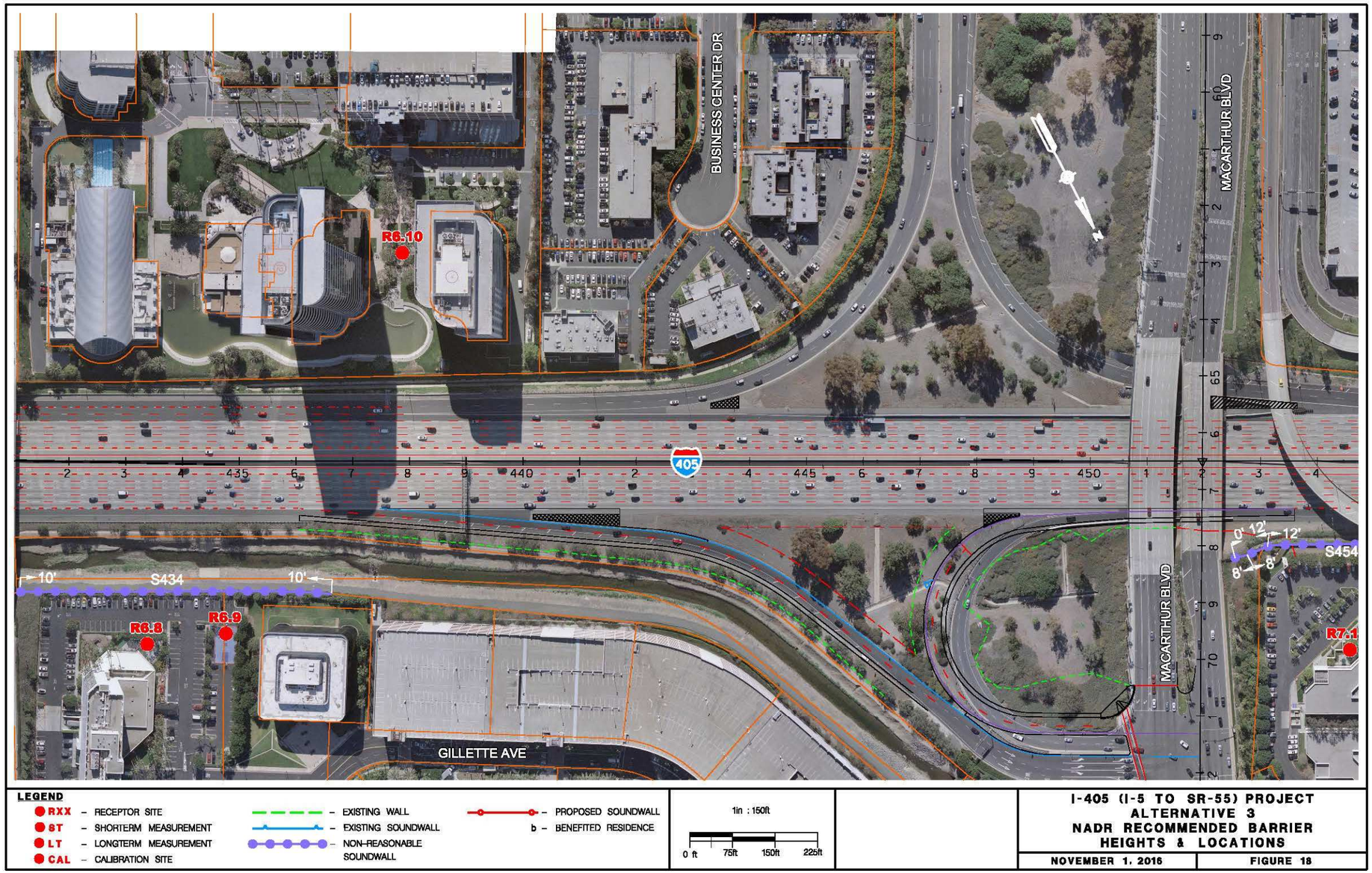

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 18 of 20)

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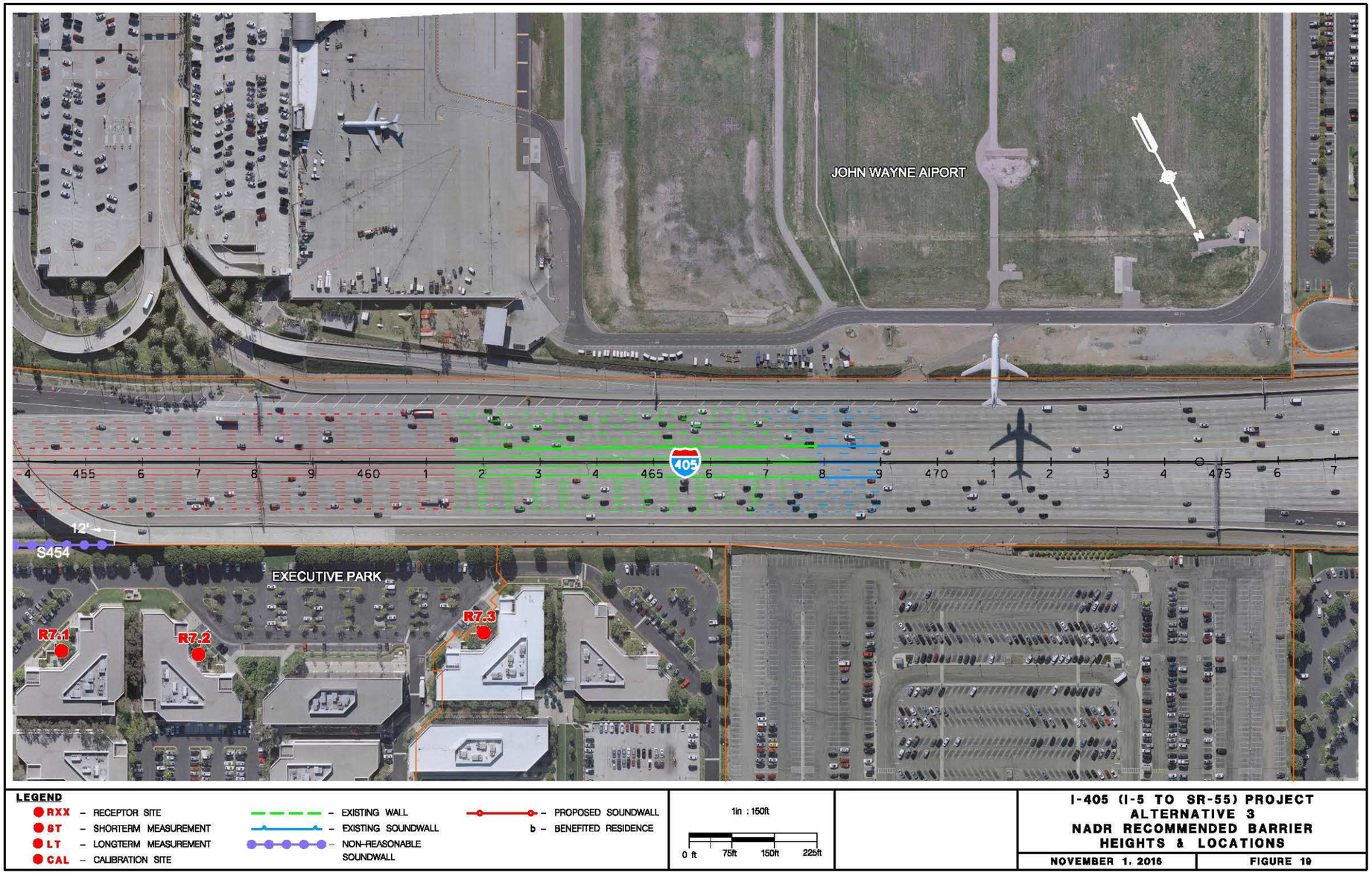

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 19 of 20)

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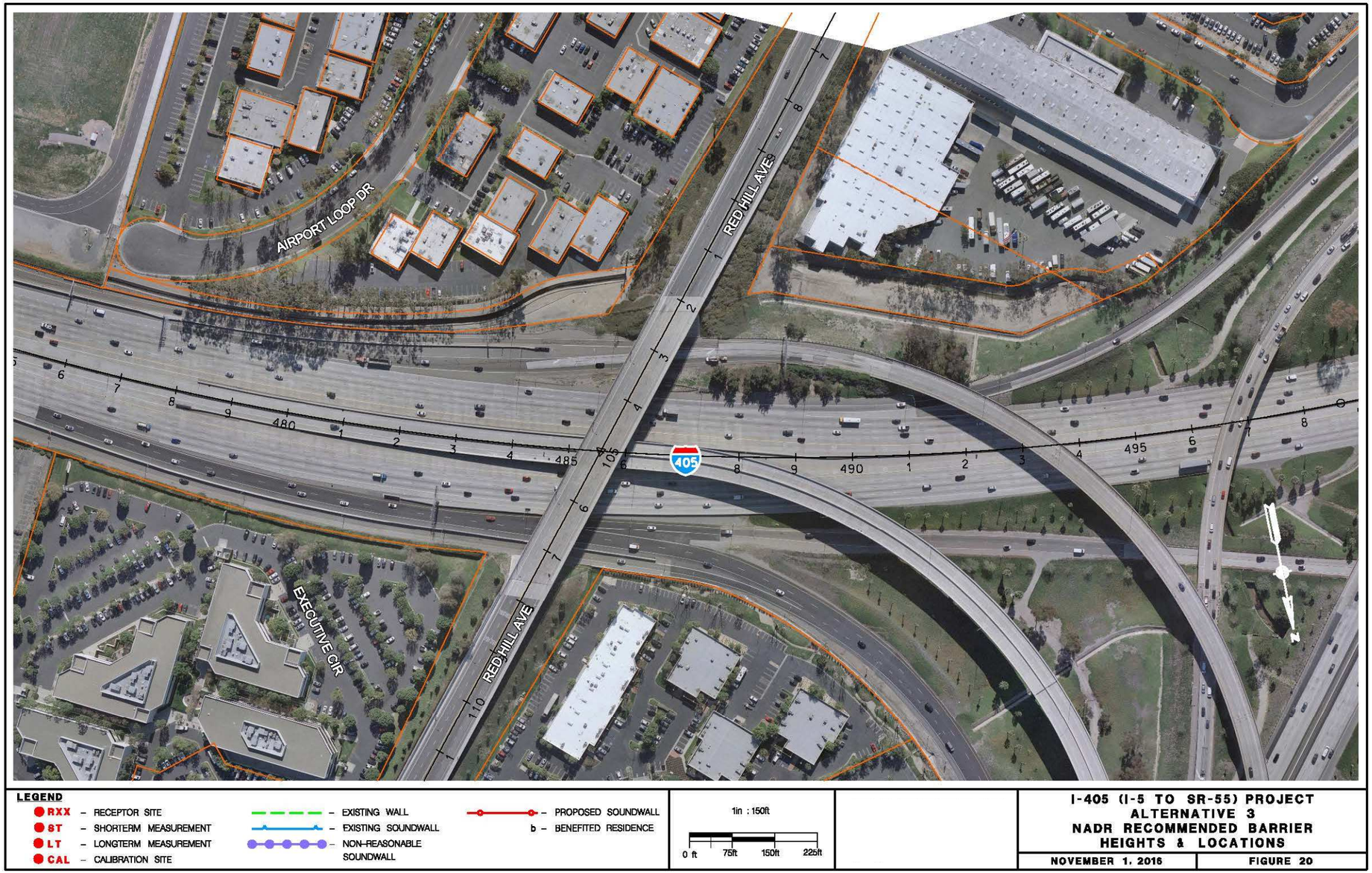

Figure 2.2.7-3. Recommended Barrier Height and Locations – Alternative 3 (Sheet 20 of 20)

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Table 2.2.7-17. Summary of Key Abatement Information (Alternative 3)

Barrier	Barrier Height	Feasible	Design Goal Achieved	Number of Benefited Receptors	Total Reasonable Allowance [R]	Estimated Construction Cost	Cost Less than Allowance
S114	8 feet	No	No	N/A	N/A	N/A	N/A
	10 feet	Yes	No	5	$400,000	$554,700	No
	12 feet	Yes	No	18	$1,440,000	$644,200	Yes
	14 feet	Yes	Yes	25	$2,000,000	$737,100	Yes
	16 feet	Yes	Yes	27	$2,160,000	$830,600	Yes
S228	12 feet	No	No	N/A	N/A	N/A	N/A
	14 feet	Yes	No	N/A	$480,000	$311,800	Yes
	16 feet	Yes	Yes	6	$480,000	$339,200	Yes
S255	8 feet	No	No	N/A	N/A	N/A	N/A
	10 feet	No	No	N/A	N/A	N/A	N/A
	12 feet	Yes	No	5	$400,000	$256,200	Yes
	14 feet	Yes	No	8	$640,000	$290,500	Yes
	16 feet	Yes	Yes	8	$640,000	$329,700	Yes
S266	8 feet	No	No	N/A	N/A	N/A	N/A
	10 feet	Yes	No	4	$320,000	$127,500	Yes
	12 feet	Yes	Yes	4	$320,000	$138,100	Yes
	14 feet	Yes	Yes	4	$320,000	$148,800	Yes
	16 feet	Yes	Yes	4	$320,000	$160,900	Yes

Table 2.2.7-17. Summary of Key Abatement Information (Alternative 3)

Barrier	Barrier Height	Feasible	Design Goal Achieved	Number of Benefited Receptors	Total Reasonable Allowance [R]	Estimated Construction Cost	Cost Less than Allowance
S322 (Option 1)	8 feet	No	No	N/A	N/A	N/A	N/A
	10 feet	No	No	N/A	N/A	N/A	N/A
	12 feet	Yes	No	11	$880,000	$516,200	Yes
	14 feet	Yes	No	17	$1,360,000	$595,900	Yes
	16 feet	Yes	Yes	23	$1,840,000	$675,700	Yes
	18 feet	Yes	Yes	33	$2,640,000	$755,400	Yes
	20 feet	Yes	Yes	33	$2,640,000	$835,200	Yes
	22 feet	Yes	Yes	33	$2,640,000	$914,900	Yes
	Design Barrier 16 and 18	Yes	Yes	33	$2,640,000	$658,300	Yes
S417	14 feet	Yes	Yes	4	$320,000	$734,200	No
	16 feet	Yes	Yes	5	$400,000	$790,400	No
	18 feet	Yes	Yes	5	$400,000	$860,500	No
	20 feet	Yes	Yes	5	$400,000	$965,300	No
	22 feet	Yes	Yes	5	$400,000	$1,001,000	No
	Design Barrier 18 and 20	Yes	Yes	5	$400,000	$872,000	No

Notes:
R = Reasonable Allowance is $80,000 per benefited residence.
Highlight = Recommended soundwall

Source: Noise Abatement Decision Report, January 2017.

With consideration of the acoustic benefit and the incremental cost, it was recommended that Soundwall S417 would be an 18- and 20-foot-high wall.

Since completion of the barrier analysis, Lennar Properties, the property owner adjacent to Soundwall S417, provided as-built updates of their development. The as-built conditions showed that their buildings are at elevations higher than those assumed in the TNM modeling for the project. Accordingly, the elevations were revised in the traffic noise impact analysis, and the resulting benefited receptors dropped from 10 to 5. This decrease reduces the reasonableness allowance to $400,000. Compared to the estimated construction cost of $860,500, Soundwall S417 would exceed the total reasonable allowance. Therefore, with consideration of the acoustic benefit and the incremental cost, Soundwall S417 is not reasonable and was removed from further consideration.

The noise abatement decision presented in this report is based on preliminary project alignments and profiles, which may be subject to change. As such, the physical characteristics of noise abatement described herein also may be subject to change. If pertinent parameters change substantially during the final project design, the noise abatement decision may be changed or eliminated from the final project design. A final decision to construct noise abatement will be made upon completion of the project design.

Project Construction Measures

The following are possible control measures that can be implemented to minimize noise disturbances at sensitive areas during construction. Standardized measures which are employed on most, if not all, Caltrans projects are indicated in bold.

N-1: Section 14-08-02 of Caltrans Standard Specifications that addresses construction noise and vibration which states “the construction noise should not exceed 86 dBa at 50 feet from the jobsite from 9 pm to 6 am.”

N-2: Control and monitor noise resulting from work activities.

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